PROJECT MANUAL – VOLUME 1 OF 2

Intermediate School Replacement

Tomball Independent School District

Tomball, Texas

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PROJECT MANUAL

Project Name:	Intermediate School Replacement – Volume 1 of 2		
Client Name:	Tomball Independent School District	Location:	Tomball, Texas
Project Number:	0802-04-01	Date:	July 15, 2026

All inquiries shall be forwarded to Chris Brennan, Huckabee; chris.brennan@huckabee-inc.com; 800.687.1229.

PROJECT TEAM

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TOMBALL INDEPENDENT SCHOOL DISTRICT

RFP-CSP #1003-26 Issued: 17 July 2026

REQUEST FOR COMPETITIVE SEALED PROPOSALS FOR THE CONSTRUCTION OF A NEW TOMBALL INTERMEDIATE SCHOOL

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I. INTRODUCTION

A. Pursuant to the provisions of the Texas Government Code § 2269, Subchapter D, it is the intent of the Tomball Independent School District (hereinafter known as Owner) to solicit proposals from qualified vendors to provide Construction services in the process as described herein.

B. Project Team: The selected Respondent will join a Project Team which will include Owner Administration, Program Manager and Architect/Engineer, all of whom will be engaged in a cooperative effort to provide the Owner with successful and cost-effective solutions for the New Tomball Intermediate School.

C. Project Information: The Owner plans to build a new two-story Intermediate School, *approximately* 134,520 sf for *approximately* 1,000 students. While the project is consolidated onto Tomball Innovation Center Campus, the facility will be located on an undeveloped portion of the Owner's property. The Project may include the following general scope items:

1. Site utilities, Concrete Paving
2. Foundation
3. Structural frame
4. Metal fabrications
5. Face brick veneer
6. Metal wall panels
7. Aluminum, glass and window wall
8. Modified Bitumen Roofing
9. Interior walls
10. Tile, resilient flooring, sheet carpeting
11. Suspended plaster, suspended drywall, lay-in panels, sound absorbing units
12. Steel doors and frames, wood doors, Kynar coated storefront, overhead coiling doors
13. Casework
14. Specialties
15. Hydraulic elevators
16. Automatic sprinkler system
17. Plumbing systems
18. HVAC Systems and building automation
19. Electrical, telecommunications systems, telephone systems, lightning protection and emergency power
20. Fire detection, alarm and emergency call systems

D. The substantial completion date is stated in the proposal form

E. The Owner's estimated cost of construction $38,000,000.00.

F. ARCHITECT:

Huckabee Architects
1700 City Plaza Dr., Suite 125
Spring, Texas 77389

G. PROGRAM MANAGER: (Owner's Representative)

Lockwood, Andrews & Newnam, Inc.
Officing at Tomball ISD
1110 Baker Drive
Tomball, Texas 77375

II. RFP ADVERTISEMENT, AVAILABILITY, AND DELIVERY

A. Proposal/Contract Documents, including Drawings, Technical Specifications, and Addenda are available for download from https://www.tomballisd.net/about-tisd/departments/finance/purchasing/bids-and-proposals. (E-bid and Bonfire are not required to submit.)

B. Responses are due in two parts; Part 1: Price proposal and required Forms, Part 2: Alternates, Unit Prices, and Key Subcontractors. Responses are due as described in RFP section III PROBABLE SCHEDULE OF EVENTS. All responses must be provided in a sealed envelope/package with RFP-CSP #1003-26 clearly printed on the face of the package and delivered to:

Attention: Mr. Zack Boles, CFO
Tomball ISD Annex Building
RFP-CSP #1003-26 New Tomball Intermediate School
1110 Baker Dr
Tomball, TX 77375

C. Questions concerning this RFP shall be directed to the Owner's Program Manager, in writing, to the email address below. Questions concerning the Contract Documents shall be addressed to the Architect, in writing, to the email address below. Verbal questions and explanations are not permitted other than as described by this section, if any. All questions are due as described in RFQ section III PROBABLE SCHEDULE OF EVENTS. Answers to questions will be issued in an Addendum by the Architect/Engineer for the Project and will be posted on Owner's Website as described in RFQ section III PROBABLE SCHEDULE OF EVENTS.

Questions concerning the RFP
Owner's Program Manager Contact Person is:

Scotty Lewis, AIA,
Program Manager
Lockwood Andrews & Newnam, Inc.
FOR: Tomball Independent School District
1110 Baker Dr.
Tomball, Texas 77375
Email: BSLewis@lan-inc.com

Questions concerning the Contract Documents
Architect's Contact Person is:

Caitlin Munch, AIA
Huckabee Architects
1700 City Plaza Dr., Suite 125

Spring, Texas 77389
Email: caitlin.munch@huckabee-inc.com

III. PROBABLE SCHEDULE OF EVENTS

- Friday, 17 July 2026 - Release Request for Proposals.

- Friday, 17 July 2026 - and Friday, 24 July 2026 – Advertisement Dates.

- Tuesday, 28 July 2026 @ 10:00 a.m. local time –Pre-Proposal Conference. The Pre-Proposal meeting agenda will include review of topics that may affect proper preparation and submittal of proposals. Attendance at the pre-proposal meeting is not mandatory, but all proposers are highly encouraged to attend.

  Location of Pre-Proposal Conference:
  1110 Baker Drive
  Tomball, TX 77375

- Friday, 31 July 2026 @ 2:00 p.m. local time – Deadline for written requests for clarifications to the RFP or Construction Documents.

- Friday, 31 July 2026 @ 2:00 p.m. local time – Completed Microsoft Excel file in response to part VII.D.2 and VII.D.3 due. Email reference checks will be sent on this day. Email Spreadsheet to Chelsea Randle at clrandle@lan-inc.com and Scotty Lewis at bslewis@lan-inc.com.

- Wednesday, 05 August 2026 @ 5:00 p.m. local time – Final Addendum will be issued at this time.

- Thursday, 13 August 2026 – Sealed Proposals due. Proposals received after the time and date set for the opening of proposals will not be accepted and will be returned unopened.

  - Part 1 Responses are due by Thursday, 13 August 2026 at 2:00 pm local time
  - Part 2 Responses are due by Thursday, 13 August 2026 at 3:00 pm local time

  Any Proposal received after such time will not be considered and will be returned unopened. Unsigned Proposals and/or Proposals received via Facsimile or Email will not be considered. Part 1 will be held unopened, and the names of Respondents withheld, by the Owner until the receipt of Part 2 responses. When Part 1 and Part 2 are received, pursuant to the provisions of the Texas Government Code §2269.151, the Owner's staff will publicly open and read aloud the names of the respondents and monetary offer stated in the Proposals Part 1 and the Alternates stated in Part 2. Within Forty-five (45) days following the date of the opening, the proposals will be evaluated and ranked in relation to the selection criteria set forth herein. Award will be made utilizing the Evaluation Criteria as required by Texas Government Code §2269.154 and as stated herein. Respondents must provide all requested information; and failure to comply with any portion of the solicitation will be reflected in the evaluation process. Proposals that have been opened may not be changed for the purpose of correcting an error

in the price. Other than price, a proposer may have the right to change any other error or mistake in the proposal as may be permitted by applicable law and subject to the approval of the Owner, unless such change would be in contravention of statutory or common law requirements or unless such change would give an unfair advantage to the proposer making such change.

- Friday, 14 August 2026 thru Friday, 21 August 2026 – Evaluation of Respondent Submittals to determine the highest ranked Respondent and determine the recommendation.

- Tuesday, 08 September 2026 thru Wednesday, 09 September 2026 – Anticipated recommendation to the Board of Trustees for Award of Contract, and authorization of Superintendent or designee to enter into negotiations with the highest ranked Respondent

IV. SUBMISSION FORMAT & CONTENT REQUIREMENTS

A. The contents of the Respondent Proposal must be complete in description, concise in volume, and austere in form.

B. The Proposal should be in the format of a written report and should be prepared on 8-1/2" x 11" sheets (single-sided) unless noted below and bound with coil or three ring binding.

1. Part 1

a) One (1) original containing an executed version of the following

(1) VII.A Letter of Interest
(2) VII.B Executive Summary
(3) VII.C Submission Questionnaire
(4) VII.D Respondent Project Experience
(5) VII.E Personnel
(6) VII.F Additional Information
(7) VII.G Optional Information
(8) VII.H Financial Information
(9) EXHIBIT A –PROPOSAL FORM
(10) EXHIBIT B – BID BOND
(11) EXHIBIT C - FELONY CONVICTION NOTIFICATION ISD VENDOR PACKET
(12) EXHIBIT D - ACKNOWLEDGMENT FORM - NON-COLLUSION STATEMENT
(13) EXHIBIT E – PROOF OF INSURABILITY
(14) EXHIBIT F – PROOF OF BONDING CAPACITY
(15) EXHIBIT G - SIGNATURE PAGE AND DECLARATION OF COMPLIANCE
(16) EXHIBIT H - DEVIATION AND EXCEPTIONS FORM

(17) EXHIBIT I – CERTIFICATE OF RESIDENCY ISD VENDOR PACKET

b) Two (2) copies of above EXCEPT that EXHIBIT A –PROPOSAL FORM and Part 2 documents are not required to be included.

c) One (1) flash drive containing:

(1) PDF of items stated in section IV.B.1.a) EXCEPT that EXHIBIT A –PROPOSAL FORM and Part 2 documents are not required to be included.

(2) Completed Microsoft Excel File in response to part VII.D.2 and VII.D.3

2. Part 2

a) One (1) original containing an executed version of the following

(1) EXHIBIT S – BID ALTERNATES AND UNIT PRICE FORM

(2) EXHIBIT T – KEY SUBCONTRACTORS

C. It is not required to re-state each question in the response. However, provide section number, and outline level description of the response item since the evaluation criteria will rely on certain sections of the response.

D. Respondents may provide supplemental materials further describing their capabilities and experience.

E. Owner is a governmental body subject to the Texas Public Information Act. Proposals submitted to Owner as a result of this procurement solicitation may be subject to release as public information after contracts are executed or the procurement is terminated. If a Respondent believes that its Proposal, or parts thereof, may be exempted from disclosure under Texas law, the Respondent must specify page-by-page and line-by-line the parts of the Proposal which it believes are exempt. In addition, the Respondent 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. Owner assumes no obligation or responsibility relating to the disclosure or nondisclosure of information submitted by Respondents.

1. The Owner strictly complies with all statutes, court decisions, and opinions of the Texas Attorney General with respect to disclosure of Respondent's information.

2. Any respondent wishing to maintain confidentiality of financial information must include a written request for same with the submission of the proposal.

V. DEFINITIONS

A. Respondent: The prime General Contractor company to join the Architect, Owner representatives and Program Manager to ensure optimal Cost Control, Scheduling, Phasing of Packages and Construction of Owner facilities.

B. Company: The prime General Contractor to join the Architect, Owner representatives and Program Manager to ensure optimal Cost Control, Scheduling, Phasing of Packages and Construction of Owner facilities.

C. Program Manager: The entity contracted by the Owner to provide overall fiduciary responsibilities and direct oversight of the contractor and A/E Team to ensure performance of actions contributing to the success of the owner's objective.

D. RFP: Request for Proposals

E. Owner: Tomball Independent School District (TISD)

VI. TERM OF CONTRACT

A. A contract awarded in response to this RFP will be for General Contracting Services for a New Tomball Intermediate School. The Owner has defined project completion dates for the anticipated work.

VII. SUBMISSION REQUIREMENTS

A. Letter of Interest

B. Executive Summary

Each respondent must include an executive summary briefly highlighting the respondent's qualifications and shall include how the respondent is most qualified to meet the evaluation criteria.

C. Submission Questionnaire

Please provide the following information in the sequence and format prescribed by this questionnaire. Supplemental materials providing additional information may be provided in a separate format, but the information requested below is to be provided in this format. Failure to provide clear, transparent, non-elusive answers will be deemed non-responsive and scored accordingly.

1. Firm Information

a) Name of Firm
b) Address of Principal Office
c) Phone and Fax Number
d) Primary Individual (Point of Contact) for this RFP; name and email

2. Firm Organization

a) Form of Business Organization (corporation, partnership, individual, joint venture, other?)

b) How many years has your organization been in business in its current capacity?

c) How many years has your organization been in business under its present name? Under what other or former names has your organization operated?

d) If your organization is a corporation, answer the following: Date of incorporation, State of incorporation, President's name, Vice-President's name(s), Secretary's name, and Treasurer's name.

e) If your organization is a partnership, answer the following: Date of organization, Type of partnership (if applicable), and Name(s) of general partner(s).

f) If your organization is individually owned, answer the following: Date of organization, Name of owner.

g) If the form of your organization is other than those listed above, describe it and name the principals.

D. Respondent Project Experience

1. Construction value

a) What is the construction dollar value, year by year, of all work under contract in all locations by your company for the period of 2020-2025?

b) What is the construction dollar value, year by year, of all work under contract in Texas by your company for the period of 2020-2025?

c) What is the construction dollar value, year by year, of all work under contract in Harris County and Montgomery County by your company for the period of 2020-2025?

d) What percentage of your company's total construction dollar value, year by year, does all work under contract in Harris County and Montgomery County by your company for the period of 2020-2025 represent?

e) What percentage of all work under contract in Harris County and Montgomery County by your company for the period of 2020-2025 has been K-12 school construction?

f) What is the full time equivalent (FTE) employee count in all Texas locations by your company for the period of 2020-2025?

g) What is the largest single executed contract value, year by year, by your company for the period of 2020-2025?

Section	2020	2021	2022	2023	2024	2025
VII.D.1.a)						
VII.D.1.b)						
VII.D.1.c)						
VII.D.1.d)						
VII.D.1.e)						

VII.D.1.f)						
VII.D.1.g)						

2. Completed Work (through substantial completion) within the last thirty-six months: List K-12 school projects constructed by your organization in Texas. The Respondent is obligated to provide accurate contact information for contacting the persons named below during a survey process that will be used during the evaluation scoring. An oversized (11x17) table format concisely depicting all projects is required. Respondents must use the Microsoft Excel file available with this RFP. For each project, provide:

a) The Owner Entity
b) Name of the Project
c) State if the project was new construction, renovation, addition or combination
d) Type of construction contract (A101, A133, Owner Unique, etc.)
e) Nature of the project/function of the building (Eg. New High School with Career Tech programs, athletic complex and natatorium)
f) Size (SF)
g) Construction delivery method (CMAR, CSP, Hard Bid, Etc.)
h) Original contract (or GMP) cost
i) Final contract (or GMP) cost
j) Number of Change Orders (if any), either cost or time, (not change proposals, contingency expenditures or similar) with brief 150 word explanation, if desired
k) Bid date/Final GMP
l) Contractual original completion date
m) Actual completion date
n) Number of claims filed by contractor with brief explanation
o) Number of RFI's
p) Name of major subcontractors
q) Owner (Primary contact) contact information (If LAN was the Program Manager, do not list LAN as the Owner's Primary Contact):

(1) Name,
(2) title,
(3) email address,
(4) phone number

r) Architect contact information:

(1) Company name
(2) Name,

(3) title,
(4) email address,
(5) phone number

3. Current Work: List up to five (5) projects of similar size and scope currently under construction by your organization. List the projects in order of priority, with the most relevant project listed first. The Respondent is obligated to provide accurate contact information for contacting the persons named below during a survey process that will be used during the evaluation scoring. An oversized (11x17) table format concisely depicting all projects is required. Respondents must use the Microsoft Excel file available with this RFP. For each project, provide:

a) The Owner Entity
b) Name of the Project
c) State if the project is new construction, renovation, addition or combination
d) Type of construction contract (A101, A133, Owner Unique, etc.)
e) Nature of the project/function of the building (Eg. New High School with Career Tech programs, athletic complex and natatorium)
f) Size (SF)
g) Construction delivery method (CMAR, CSP, Hard Bid, Etc.)
h) Original contract (or GMP) cost
i) Current contract (or GMP) cost
j) Number of Change Orders (if any) through current period, either cost or time, (not change proposals, contingency expenditures or similar) with brief 150-word explanation, if desired
k) Bid date/Final GMP
l) Contractual completion date
m) Number of claims filed by contractor with brief explanation
n) Number of RFI's (To date)
o) Name of major subcontractors
p) Owner (Primary contact) contact information (If LAN was the Program Manager, do not list LAN as the Owner's Primary Contact):

(1) Name,
(2) title,
(3) email address,
(4) phone number

q) Architect contact information:

(1) Company name
(2) Name,
(3) title,
(4) email address,

(5) phone number

4. Contracting and Subcontracting:

a) List the List the categories of work that your organization normally performs with its own forces. Would you propose to do any work with your own forces?

b) List any subcontractors in which your organization has some ownership and list the categories of work those subcontractors normally perform.

5. Claims, Suits and Failure to Perform: (If the answer to any of the questions below is yes, please provide details). Note: Do not fail to respond to this question or furnish vague responses. Point totals available under this category of evaluation will be affected if you choose not to fully respond.

a) Has your organization ever failed to complete any work awarded?

b) Are there any judgments, claims, arbitration proceedings or suits, pending or outstanding against your organization or its officers?

c) Has your organization filed or been involved in any lawsuits or requested arbitration with regard to construction contracts within the last sixty months?

d) Within the last sixty months, has any officer or principal of your organization ever been an officer or principal of another organization when it failed to complete a construction contract?

6. Safety

a) Provide bidder's OSHA (Occupational Safety and Health Administration) inspection logs for the last three year

b) Provide a loss analysis from the bidder's insurance carrier

c) Provide a loss history covering all lines of insurance coverage carried by the bidder

E. Personnel

1. Provide an organizational chart outlining all personnel that will be assigned to the project and their responsibilities.

2. Given the scope and schedule of the project, identify the personnel proposed, specifically the Project Manager, Job Superintendent or Superintendent(s), and Field Operations personnel proposed to work on the project. Prior to contracting, the Owner may interview the Project Manager/Job Superintendent that will be assigned to the project. Please reference these personnel to projects listed in items VII.D.2 and VII.D.3 where possible.

a) Provide a resume and references for each individual stating

(1) Proposed role on this project
(2) Description of responsibilities for this proposed role (what will this person do?)
(3) Relevant past project experience list with role that makes this individual the best choice for this project (Client, cost, seasonal construction schedule, repairs, renovations, new construction, HVAC, etc.)
(4) General background information; education, years of experience, registrations, affiliations,
(5) Years of service with your company
(6) Prior two (2) employers and years of service with each
(7) Last three (3) completed or ongoing project assignments
(8) Contact information (Name, title, email address, phone number) for Owner's representative or Architect that could address questions regarding this individual for the last three (3) completed or ongoing projects

F. Additional Information

1. Letters of Recommendation: Furnish five (5) letters of recommendation from past or current K-12 Texas school district customers of the respondent, preferably from those projects listed in section VII.D.2and VII.D.3.

G. Optional Information

1. Furnish any additional content not requested by other sections of this RFP that demonstrates the qualifications of your company

H. Financial Information

1. Attach an audited financial statement, including your organization's latest balance sheet and income statement showing the following items:

a) Current assets (e.g., cash, joint venture accounts, accounts receivable, notes receivable, accrued income, deposits, materials inventory, and prepaid expenses).
b) Non-current assets (e.g., net fixed assets, other assets).
c) Current liabilities (e.g., accounts payable, notes payable, accrued expenses, provision for income taxes, advances, accrued salaries and accrued payroll taxes).
d) Non-current liabilities (e.g., notes payable).
e) Capital accounts and retained earnings (e.g., capital, capital stock, authorized and outstanding shares par value, earned surplus, and retained earnings).
f) Name and address of firm preparing attached financial statement and date thereof.

g) Is the attached financial statement for the identical organization named under item VII.H.1 above? If not, explain the relationship and financial responsibility of the organization whose financial statement is provided (e.g., parent subsidiary).

h) Will the organization whose financial statement is attached act as guarantor of the contract for construction?

i) Provide name, address and phone number of your financial institution.

2. Bonding

a) Provide Name of bonding company and name and address of agent.

b) Provide letter from bonding company stating the currently available bonding capacity of your company (Bonding limit minus current obligations)?

VIII. AMENDMENTS TO THE RFP

A. Changes, amendments, or written responses to questions received regarding this RFP will be posted on the Owner's website. It is Respondent's responsibility to review this site and ascertain whether any amendments have been made prior to submission. No oral statement of any person shall modify or otherwise change or affect the terms, conditions or specifications stated in the RFP, and changes to the RFP – if any – shall be made in writing only.

IX. RESTRICTIONS ON COMMUNICATION

A. The Respondent's, or any agent or representative of Respondent shall not undertake any activities or actions to promote or advertise their qualifications or submission to any member of the Owner's Board of Trustees, the Owner's Administration or their respective staff persons, except as specifically requested in writing by to the named point of contact in section II.C at any time between the date of release of the RFP and the date of award of a contract by the Owner's Board of Trustees. This restriction extends to "thank you" letters, phone calls, emails and any contact that results in the direct or indirect discussion of the RFP and/or submission submitted by Respondent's. Violation of this provision by Respondent or his/her/its agent may lead to disqualification of his submission from consideration.

B. The Owner reserves the right to contact any Respondent for clarification after responses are opened and/or to further negotiate with any Respondent if such is deemed desirable by Owner.

X. EVALUATION

A. The Owner will conduct a comprehensive evaluation of all submissions received in response to this RFP. The Owner may appoint a selection committee to perform the evaluation.

B. Each submission will be analyzed to determine overall responsiveness, qualifications under the RFP and Respondent's cost proposal. Respondents will be scored based upon these criteria listed in this RFP. The Owner may request additional information from Respondent's

at any time prior to final approval of a selected Respondent. Final approval of a selected Respondent(s) is subject to the action of the Board of Trustees of the Owner.

C. The Owner reserves the right to conduct all research it deems necessary as part of its evaluation of Respondent's including their previous clients.

D. The Owner will utilize the following criteria in the evaluation of responses:

Points Value	**Category**	**Evaluation Method**	**Reference Section**
30	Proposed Amount for Base Proposal and Owner-Selected Alternates	Respondent will receive an assigned share of the total available points in this category according to banded point categories shown in the "Table of Awarded Points". A formula will be used as follows to determine the award band for your proposal based on your percentage above the low bid: Percentage Above Low Bid=((Your combination of base price proposal and Owner-selected Alternates minus the minimum proposed combination of base price proposals and Owner-selected Alternates)/(minimum proposed combination of base price proposals and Owner-selected Alternates)). The result of the formula will be used to proportion the points awarded based on the "Table of Awarded Points"	XIII
25	Evaluation Survey of Company References and Project Contacts	Respondent's references and stated project contacts will be sent a request to participate in a survey of your company. The weighted average overall score for your company will be used to allocate a pro-rated share of the total available points in this category. If 4 or fewer responses are received, your company will earn fractional points for this category. You are responsible for accuracy of email address. A formula will be used as follows: ("Reference Factor" * points available in the category). "Reference Factor" is determined as follows: If 4 or fewer responses =((Your Firm Average Score - Min of all Firms) / (Max of all Firms - Min of all Firms)) * (number of responses * 20%) OR If 5 or more responses = (Your Firm Average Score - Min of all Firms) / (Max of all Firms - Min of all Firms). A minimum value not less than 20% of the available points will be awarded as a floor value. Note: by default, under the scoring above, one firm will earn all points and one firm will earn the points floor.	VII.D.2, VII.D.3

15	History of Company Performance	Respondent demonstrates consistent and average past and current workload to staff ratio, showing ability to adequately staff the work and company stability. Respondent shows no or little past history of claims, suits and failure to perform. Respondent shows low number of RFI Generated per project. Respondent shows ability to maintain cost with no cost increases. Positive safety record. Positive asset to liability ratio. Adequate bonding capacity. Strength of letters of reference.	VII.D.1, VII.D.2.n), VII.D.3.m), VII.D.5, VII.D.2.o), VII.D.3.n), VII.D.2.h), VII.D.2.i), VII.D.2.j), VII.D.3.h), VII.D.3.i), VII.D.6, VII.H.1, VII.H.2, VII.F.1
15	Similar Company Project Experience and Qualifications	Respondent company demonstrates similar company project experience by showing high proportion of Harris and Montgomery County region work, projects of comparable cost, complexity and timeframe to the work in the RFP. Respondent demonstrates high proportion of past experience with subcontractors named in proposal.	VII.D.1, VII.D.2, VII.D.2.p), VII.D.3.o), VII.D.3, VII.D.4, XXXII
10	Similar Individual Personnel Project Experience and Qualifications	Respondent individual personnel proposed for the work in the RFP demonstrate similar project experience by showing high proportion of Harris and Montgomery County region work, projects of comparable cost, complexity and timeframe to the work in the RFP. Organizational approach to the project is clear.	VII.E.2.a), VII.E.1
5	Prior Positive Experience with Owner	Respondent will earn 2.5 points if no prior experience with Owner. Respondent will earn increased points for positive prior experience. Respondent will earn reduced points for negative prior experience	

Table of Awarded Points

The lowest price receives the maximum points, with others receiving points based on a percentage comparison with the lowest cost proposed.

XI. AWARD OF CONTRACT AND RESERVATION OF RIGHTS

A. The Form of Contract will be AIA Document A101 - 2017, attached in Section XXXV, including incorporated reference files.

B. The Contract, if awarded, will be awarded to the Respondent whose Submission is deemed most advantageous to the Owner, upon approval of the Owner's Board of Trustees.

C. The Owner may accept any Submission in whole or in part. If subsequent negotiations are conducted, they shall not constitute a rejection or alternate RFP on the part of the Owner; however, final selection of a Respondent is subject to approval by the Owner's Board of Trustees.

D. The Owner reserves the right to accept one or more Submissions, or reject any or all Submissions received in response to this RFP, and to waive informalities and irregularities in the Submissions received. The Owner also reserves the right to terminate this RFP, and reissue a subsequent Solicitation, and/or remedy technical errors in the RFP Process.

E. This RFP does not commit the Owner to enter into a Contract, award any services related to this RFP, nor does it obligate the Owner to pay any costs incurred in preparation for submitting of the Submission for this RFP, or in anticipation of a Contract.

F. Access and Audit Rights: The Owner, or its authorized representative, shall be afforded unrestricted access to and permitted to inspect and copy all the respondent's records, which shall include but not be limited to accounting records (hard copy as well as computer readable data), correspondence, instructions, drawings, receipts, vouchers, memoranda and similar data relating to this Contract. The respondent shall preserve all such records for a period of five (5) years, or for such longer period as may be required by law, after final payment under this Contract. If this Contract is funded from contract/grant funds provided by the U.S. Government or the State of Texas, the Contract, books, and records shall be available for review and audit by the Comptroller General of the U.S. and/or the Inspector general of the federal sponsoring agency, or the State of Texas and its duly authorized representatives.

G. Appeal/Protest Process. Any respondent who submitted a proposal may appeal the Owner's award, if the appeal is based on deviations from laws, rules, regulations, or Owner policies. Owner Board Policy GF(Local) applies to any respondent wishing to appeal a proposal and/or award of a contract. In the event respondent is unsure about the award of the contract, it is the Proposer's responsibility to contact the Owner on the next business day after the award is announced and verify details concerning the award.

XII. PROPOSAL MODIFICATIONS AND WITHDRAWAL PRIOR TO PROPOSAL OPENING

A. A Respondent may modify a Proposal by letter at any time prior to the submission deadline for receipt of Proposals. Modification requests must be received prior to the submission deadline. Modifications made before opening time must be initialed by Respondent guaranteeing authenticity. Proposals may not be amended or altered after the official opening with the single exception that any product literature and/or supporting data required by the actual specifications, if any, will be accepted at any time prior to the Owner's Board of Trustees consideration of same.

B. Likewise, any Respondent may modify a proposal by submitting a supplemental proposal in person prior to the scheduled closing time for receipt of proposals. Such supplemental proposal should mention only additions or subtractions to the original proposal so as to not reveal the final prices or terms to the Owner until the sealed proposal is open.

C. The Respondent or his duly authorized representative may withdraw a proposal by request, provided such request is received by Owner at the place designated for receipt of proposals and prior to the time fixed for the opening of proposals. The Proposal Bond will be returned with the proposals if withdrawn in accordance with the above. The withdrawal of a proposal does not prejudice the right of the Respondent to file a new proposal at the time and place stated.

XIII. EXHIBIT A –PROPOSAL FORM

Having examined the Request for Proposal prepared by the Owner, and in submitting this proposal, the undersigned agrees to the following:

1. To hold the proposal open for acceptance by the Owner for 60 days.
2. To hold alternate proposals open for acceptance by the Owner for 120 days
3. To execute Contract Documents within ten (10) days after the prescribed forms are presented for signature and give bond with good and sufficient surety or sureties, as may be required, for the faithful performance and proper fulfillment of such contract.
4. The Owner maintains the right to reject any or all proposals, to waive informalities or minor irregularities in the proposal process and to accept the proposal which the Owner considers most advantageous. The Owner reserves the right to verify the accuracy and completeness of all responses by utilizing any information available to the Owner without regard to whether such information appears in the submission.
5. That this Proposal has been arrived at independently and is submitted without collusion with anyone to obtain information or gain any favoritism that would in any way limit competition or give an unfair advantage over respondents in the award of this proposal.
6. The Owner reserves the right to negotiate with any Respondent in a manner permitted by law.
7. The undersigned has reviewed the Contract and exhibits as modified by Owner and agrees to execute a final version of these contacts in accordance with the attached terms, subject to final approval by Owner.
8. By providing a response, each Applicant agrees to waive any claim it has or may have against the Owner, its Trustees, agents and employees, and any reference sources, arising out of or in connection with: the administration, evaluation, or recommendation of any response; waiver of any requirements in the Request for Proposals; acceptance or rejection of any response and award of the Contract.
9. The cost of developing a response is the sole responsibility of the Applicant. The Owner will not provide reimbursement of such cost, and will not be liable for any preparation cost for any reason whatsoever.
10. Respondent has visited the site of the proposed work and fully acquaint themselves with the existing conditions there and should fully inform themselves as to the facilities involved, the difficulties and restrictions attending the performance of the contract. The Respondent should thoroughly examine and familiarize themselves with the drawings, technical specifications and all other contract documents. The contractor by the execution of the contract shall in no way be relieved of any obligation under it due to his failure to receive or examine any form or legal document or to visit the site or acquaint themselves with the conditions there existing. The Owner will be justified in rejecting any claim based on lack of inspection of the site prior to the proposal.
11. The unit price, if requested, for each of the several items in the proposal shall include its pro rata share of overhead so that the sum of the products obtained by multiplying the quantity shown for each item by the unit price proposal represents the total proposal. Any proposal not conforming to this requirement may be rejected as informal. Special attention is drawn to this condition, as the unit prices will be used to determine the amount of any change orders resulting from an increase or decrease in quantities.

Submit with Part 1

Company Name:_____

1. **Contract Time:** The undersigned agrees that, if the proposal is accepted, the Date of Commencement shall be 01 October 2026 which will be established in a "Notice to Proceed" from the Owner and to obtain Substantial Completion of all work not later than 15 May 2028, subject to extensions of time as described in the Contract Documents.

2. **Construction Permit:** The undersigned acknowledges that the bid or proposal has been submitted with the understanding that the time from submission of the bid, or proposal until a building permit will be released is estimated as **90 calendar days**. The owner may issue a notice to proceed prior to the date when a building permit is released and the contractor shall commence all activities on the project for which a building permit is not required, such as project submittals, site mobilization, subcontractor buyout, and similar activities.

3. **Addenda:** The undersigned acknowledges receipt of:

Addenda 1 .....dated ..... _ _/_ _/_ _ _ _

Addenda 2 .....dated ..... _ _/_ _/_ _ _ _

Addenda 3 .....dated ..... _ _/_ _/_ _ _ _

Addenda 4 .....dated ..... _ _/_ _/_ _ _ _

Addenda 5 .....dated ..... _ _/_ _/_ _ _ _

4. **Base Proposal:** The undersigned agrees to perform the complete Work of this Project, for the lump sum price of (The Base Proposal includes all allowances listed in the Section 01 2100):

_____Dollars

(Amount written in words governs)

$_____(Amount in figures)

Company:_____

Address:_____

City ST Zip

Telephone:_____ Fax:_____ Email:_____

Printed Name/Title:_____ Signature:_____

State whether firm is a: ❒ Corporation ❒ Partnership ❒ Individual

Submit with Part 1

XIV. EXHIBIT B – BID BOND

A bond in the amount of five (5) percent of the proposal issued by an acceptable surety licensed to do business in the State of Texas shall be submitted with each proposal. A certified check or bank draft payable to the Owner or negotiable U.S. Government Bonds (as par value) may be submitted in lieu of the Proposal Bond. Respondents are advised that performance and payment bonds are required for each project.

The bond, or its comparable, will be returned to the Respondent as soon as practical after the opening of the proposals.

Furnish Bid Bond.

Submit with Part 1

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we the undersigned, _____ as PRINCIPAL, and _____ _____, as SURETY are held and firmly bound unto _____ _____ hereinafter called the "Owner", in the penal sum of _____ _____ Dollars, ($_____), lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Principal has submitted the Accompanying Bid, dated _____, for _____

NOW, THEREFOR, if the Principal shall not withdraw said Bid within the period specified therein after the opening of the same, or, if no period be specified, within sixty (60) days after the said opening, and shall within the period specified therefor, or if no period be specified, within ten (10) days after the prescribed forms are presented to him for signature, enter into a written contract with the Owner in accordance with the Bid as accepted, and give bond with good and sufficient surety or sureties, as may be required, for the faithful performance and proper fulfillment of such contract; or in the event of the withdrawal of said Bid within the period specified, or the failure to enter into such Contract and give such bond within the time specified, if the Principal shall pay the Owner the difference between the amount specified in said Bid and the amount for which the local Public Agency may procure the required work or supplies or both, if the latter be in excess of the former, then the above obligation shall be void and of no effect, otherwise to remain in full force and virtue.

IN WITNESS THEREOF, the above-bounded parties have executed this instrument under their several seals this _____ day of _____, the name and corporate seal of each corporate party being hereto affixed and these present signed by its undersigned representative, pursuant to authority of its governing body.

(SEAL)

_____

(SEAL)

Attest: By: _____

Affix

Corporate

Seal

Submit with Part 1

Attest: By: _____

Affix

Corporate

Seal

Attest: By: _____

Countersigned

By _____

* Attorney-in-Fact, State of _____

CERTIFICATE AS TO CORPORATE PRINCIPAL

I, _____, certify that I am the _____, _____, Secretary of the Corporation named as Principal in the within bond; that _____, who signed the said bond on behalf of the Principal was then _____ of said corporation; that I know his signature, and his signature thereto is genuine; and that said bond was duly signed, sealed, and attested to, for and in behalf of said corporation by authority of this governing body.

Corporate

Seal

Title: _____

* Power-of-attorney for person signing for surety company must be attached to bond.

Submit with Part 1

XV. EXHIBIT C - FELONY CONVICTION NOTIFICATION

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 Owner 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."

Subsection (b) states "a school Owner may terminate a contract with a person or business entity if the Owner 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 Owner 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 company 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)_____

My company is a publicly held corporation; therefore, this reporting requirement is not applicable: Signature of Company Official

_____

Submit with Part 1

b. My company is not owned nor operated by anyone who has been convicted of a felony.
Signature of Company Official

_____

c. My company 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_____

Submit with Part 1

XVI. EXHIBIT D - ACKNOWLEDGMENT FORM - NON-COLLUSION STATEMENT

The undersigned affirms that they are duly authorized to execute this contract, that this company, corporation, firm, partnership or individual has not prepared this submission in collusion with any other Respondent, 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.

Vendor:_____

Address: _____

Phone: _____

Respondent (Signature):_____

Respondent (Print Name):_____

Position with Company:_____

Signature of CompanyOfficial_____

Authorizing Submission: _____

Company Official (Print Name):_____

Official Position: _____

Submit with Part 1

XVII. EXHIBIT E – PROOF OF INSURABILITY

Furnish proof of insurability from your insurance provider meeting the requirements set forth in the Contract, attached to this RFP. This can be in the form of a letter or other sample certificates attesting to the ability to comply with the insurance requirements.

Submit with Part 1

XVIII. EXHIBIT F – PROOF OF BONDING CAPACITY

Furnish proof of bonding capacity from your bonding agent stating the **bonding limits, current obligations and free bonding capacity** meeting the requirements set forth in the Contract Documents, attached to this RFP. This can be in the form of a letter.

Submit with Part 1

XIX. EXHIBIT G - SIGNATURE PAGE AND DECLARATION OF COMPLIANCE

Circle below to indicate the business structure of Respondent

Individual/Sole Proprietorship	Partnership or Joint Venture
Corporation	Other Entity (State Type)

The undersigned certifies that (s) he is _____(title) of the Respondent entity named below; that (s)he is authorized to sign this Submission Form (if a Corporation then by resolution with Certified Copy of resolution attached) for and on behalf of the entity, if any, named below, and that (s)he is authorized to execute same for and on behalf of and bind said entity to the terms and conditions provided for in the Submission as required by this RFP, and has the requisite authority to execute an Agreement on behalf of Respondent, if awarded, and that the 11-digit Comptroller's Taxpayer Number for the entity, if any, is:

11-digit Comptroller's Taxpayer Number Employer Identification Number: _____

Respondent Organization Name_____

By: _____

Printed Name: _____

Title: _____

By: _____

Submit with Part 1

(If Respondent is a Joint Venture, an authorized signature from a representative of each party is required)

Printed Name: _____

Title: _____

By signing this Signature Page and Declaration of Compliance, I do hereby declare that I have read the Request for Proposal on which our Submission is submitted with full knowledge of the requirements and do hereby agree to furnish all services in full accordance with the requirements outlined in the Request for Proposal.

By signing and executing this submission, I further certify on behalf of my organization and represent to the Owner that Respondent has not offered, conferred or agreed to confer any pecuniary benefit, as defined by TEXAS PENAL CODE ANN.§ 218, or any other thing of value, as consideration for the receipt of information or any special treatment or advantage relating to this submission; the Respondent also certifies and represents that Respondent has not offered, conferred or agreed to confer a pecuniary benefit or other things of value as consideration for the recipients decision, opinion, recommendation, vote or other exercise of discretion concerning this submission; the Respondent certifies and represents that Respondent has neither coerced nor attempted to influence the exercise of discretion by any officer, trustee, agent or employee of the Owner concerning this submission on the basis of any consideration not authorized by law; the Respondent also certifies and represents that Respondent has not received any information not available to other Respondent so as to give the undersigned a preferential advantage with respect to this submission; the Respondent further certifies and represents that Respondent has not violated any state, federal or local law, regulation or ordinance relating to bribery, improper influence, collusion or the like and that Respondent will not in the future offer, confer, or agree to confer a pecuniary benefit or other thing of value to any officer, trustee, agent or employee of the Owner in return for the person having exercised the persons official discretion, power or duty with respect to this submission; the Respondent certifies and represents that it has not nor and will not in the future offer, confer, or agree to confer a pecuniary benefit or other thing of value to any officer, trustee, agent or employee of the Owner in connection with information regarding this submission, the submission of this submission, the award of this submission or the performance, delivery or sale pursuant to this submission.

Submit with Part 1

XX. EXHIBIT H - DEVIATION AND EXCEPTIONS FORM

All respondents are expected to fully comply with all Terms and Conditions of this RFP, including all dates noted, the AIA A101-2017 Standard Form of Agreement and the AIA A201-2017 General Conditions of the Contract for Construction as amended by the Owner. Any proposed deviations or exceptions to the Terms and Conditions of this RFP, including AIA documents, MUST be noted on this sheet. In the absence of any entry on this Deviation Form, the respondent assures the Owner of their full compliance with the Terms and Conditions of this RFP and the AIA documents.

Any exceptions to the modified AIA Contract Documents should be noted along with suggested wording for each exception. Owner will consider any such exceptions in its evaluation of the Proposer's proposal but is not obligated to accept any such exceptions or proposed modifications. If the Proposer and Owner are unable to resolve any exceptions to the mutual satisfaction of both parties, Owner reserves the right to reject the Proposer's proposal and award the Contract to another Proposer. Each Proposer, by making its proposal, represents that the Proposer has read, understands, and agrees to Owner's modifications to the AIA Documents. If a project is awarded to a Proposer and the Proposer requests changes to the Contract Documents, the Owner reserves the right to cancel the award and re-award the Project to an alternate Proposer. Requests to modify the terms of the Contract Documents during the pendency of this RFP will be denied.

Note that this deviation and exceptions form is NOT intended to note any deviations from the Construction Documents or Specifications and other information contained within the Project Manual. Any questions regarding those must be submitted in writing, per the terms of this RFP, and will be addressed accordingly in an Addenda.

The Owner will, at is sole discretion, determine whether the deviations listed below are acceptable. Furnish a description of the requested deviation, noting the impact that the proposed deviation will have on the cost and time of the project, if any, if accepted by the Owner. THIS DEVIATION FORM MUST BE SIGNED BY EACH RESPONDENT WHETHER THERE ARE DEVIATIONS LISTED OR NOT AND SUBMITTED WITH THIS PROPOSAL. THE PROPOSAL FURNISHED SHALL NOT BE QUALIFIED OR CONDITIONED IN ANY WAY ON ACCEPTANCE OF THE DEVIATIONS AND EXCEPTIONS LISTED BELOW.

DEVIATION: Cost (+-) Time (+-)

Respondent Organization Name_____

Authorized Signature_____

Submit with Part 1

XXI. EXHIBIT I – CERTIFICATE OF RESIDENCY

The State of Texas has passed a law concerning non-resident contractors. This law can be found in the Texas Government Code under Chapter 2252, Subchapter A. This law makes it necessary for the Owner to determine the residency of its bidders. In part, this law reads 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 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 greater of the following:

(1) 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; or

(2) 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 a majority of the manufacturing relating to the contract will be performed."

I certify that_____
(Name of Company Bidding) is, under Section: 2252.001 (3) and (4),

_____Resident Bidder _____Non-resident Bidder

My or our principal place of business under Section: 2252.001 (3) and (4), is in the city of

_____ in the state of _____

_____
Signature of authorized Company Representative

_____
Print Name

_____ ___/___/___

Title Date

Submit with Part 1

XXII. EXHIBIT J - VENDOR STATEMENT OF DEBARMENT/SUSPENSION

I have read the conditions and specifications provided in the Request for Proposal document attached. I affirm, to the I have read the conditions and specifications provided in the Request for Qualifications document attached. I affirm, to the best of my knowledge, the company I represent has not been debarred or suspended from conducting business by the federal government or the State of Texas.

Debarment and Suspension (Executive Orders 12549 and 12689)—A contract award (see 2 CFR 180.220) must not be made to parties listed on the government wide exclusions in the System for Award Management (SAM), in accordance with the OMB guidelines at 2 CFR 180 that implement Executive Orders 12549 (3 CFR part 1986 Comp., p. 189) and 12689 (3 CFR part 1989 Comp., p. 235), "Debarment and Suspension." SAM Exclusions contains the names of parties debarred, suspended, or otherwise excluded by agencies, as well as parties declared ineligible under statutory or regulatory authority other than Executive Order 12549.

Pursuant to applicable law, the contractor certifies that during the term of an award for all contracts by the Owner resulting from this procurement process, the contractor certifies that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation by any federal department or agency or by the State of Texas. Contractor shall immediately provide written notice to the Owner if at any time the contractor learns that this certification was erroneous when submitted or has become erroneous by reason of changed circumstances. The Owner may rely upon a certification of a contractor that the contractor is not debarred, suspended, ineligible, or voluntarily excluded from the covered contract, unless the Owner knows the certification is erroneous.

Name of Company/Firm: _____

Mailing Address: _____

City/State/Zip: _____

Email Address: _____

Prepare By: _____

Company Official's Name: _____
Printed

Company Official's Authorized Signature: _____

TITLE _____

TELEPHONE NUMBER_____ FAX NUMBER DATE _____

Submit with Part 1

XXIII. EXHIBIT K – REQUEST FOR TAXPAYER IDENTIFICATION NUMBER

Complete and submit Internal Revenue Service for "W-9"

Submit with Part 1

XXIV. EXHIBIT L – FORM 1295-CERTIFICATE OF INTERESTED PARTIES

Complete and submit Texas Ethics Commission Form 1295 at the Texas Ethics Commission web site at https://ethics.state.tx.us/forms/1295.pdf.

Certificate of Interested Parties (Form 1295 – must be filled out electronically with the Texas Ethics Commission's online filing application and attached to proposal)

Owner 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 applies to a contract of Owner that (1) requires an action or vote by the Owner Board of Trustees before the contract may be signed; (2) has a value of at least $1 million; or (3) is for services that would require a person to register as a lobbyist under Tex. Gov't Code Chapter 305. Section 2252.908 prohibits Owner 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 Owner at the time business entity submits the signed contract. Effective January 1, 2018, the Form 1295 requirement does not apply to: (1) a contract with a publicly traded business entity or wholly owned subsidiary of the same; (2) an electric utility; or (3) a gas utility. The Texas Ethics Commission has adopted rules requiring the business entity to file Form 1295 electronically with the Texas Ethics Commission. The following **definitions** apply:

(1) ***"Business Entity"*** means an entity recognized by law through which business is conducted, including a sole proprietorship, partnership, or corporation. TEX. GOV'T CODE § 2252.908(1).

(2) ***"Interested Party"*** means a person:
   a) who has a controlling interest in a business entity with whom Owner 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. TEX. GOV'T CODE § 2252.908(3).

(3) ***"Controlling interest"*** means:
   a) an ownership interest or participating interest in a business entity by virtue of units, percentage, shares, stock, or otherwise that exceeds 10 percent;
   b) 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
   c) 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. *Subsection (c) does not apply to an officer of a publicly held business entity or its wholly owned subsidiaries.* TEX. ETHICS COMM. RULE 46.3(c).

(4) ***"Intermediary"*** means a person who actively participates in the facilitation of the contract or negotiating the contract, including a broker, adviser, attorney, or representative of or agent for the business entity who:
   a) receives compensation from the business entity for the person's participation;
   b) communicates directly with the governmental entity or state agency on behalf of the business entity regarding the contract; and
   c) is not an employee of the business entity. TEX. ETHICS COMM. RULE 46.3(e).

As a "business entity," all vendors must:

(1) complete 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
- **All vendors must complete Form 1295, even if no interested parties exist**
- In Section 2, insert "Tomball ISD"
- In Section 3, insert the "RFQ-CSP #1003-26" for this proposal

(2) print a copy of the completed form (make sure that it has a computer-generated certification number in the "Office Use Only" box)

(3) have an authorized agent of the business entity **sign the form**

(4) submit the completed Form 1295 by **attaching the form to your proposal.**

Submit with Part 1

OWNER 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 receipt by OWNER. After OWNER 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 OWNER.

Submit with Part 1

XXV. EXHIBIT M – CERTIFICATION REGARDING TERRORIST ORGANIZATIONS AND BOYCOTT OF ISRAEL

Respondent 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. (Tex. Gov't Code §§ 2252.151-.154)

If (a) Respondent is not a sole proprietorship; (b) Respondent has ten (10) or more full-time employees; and (c) this Agreement has a value of $100,000 or more, the following certification shall apply; otherwise, this certification is not required. Pursuant to Chapter 2271 of the Texas Government Code, the Respondent hereby certifies and verifies that neither the Vendor, nor any affiliate, subsidiary, or parent company of the Respondent, if any (the "Respondent Companies"), boycotts Israel, and the Respondent agrees that the Respondent and Respondent Companies will not boycott Israel during the term of this Agreement. For purposes of this Agreement, the term "boycott" shall mean and include refusing to deal with, terminating business activities with, 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, but does not include an action made for ordinary business purposes.

Name of Company/Firm: _____

Mailing Address: _____

City/State/Zip: _____

Email Address: _____

Prepare By: _____

Company Official's Name: _____
Printed

Company Official's Authorized Signature: _____

TITLE _____

TELEPHONE NUMBER_____ DATE _____

Submit with Part 1

XXVI. EXHIBIT N – CERTIFICATION REGARDING BOYCOTTING CERTAIN ENERGY COMPANIES

If (a) Vendor is not a sole proprietorship; (b) Vendor has ten (10) or more full-time employees; and (c) this Agreement has a value of $100,000 or more that is to be paid wholly or partly from public funds, the following certification shall apply; otherwise, this certification is not required. Pursuant to TEX. GOV'T CODE Ch. 2274 of SB 13 (87th session), Vendor hereby certifies and verifies that Vendor, or any wholly owned subsidiary, majority-owned subsidiary, parent company, or affiliate of these entities or business associations, if any, does not boycott energy companies and will not boycott energy companies during the term of the Agreement. For purposes of this Agreement, the term "company" shall mean an organization, association, corporation, partnership, joint venture, limited partnership, limited liability partnership, or limited liability company, that exists to make a profit. The term "boycott energy company" shall mean "without an ordinary business purpose, refusing to deal with, terminating business activities with, or otherwise taking any action intended to penalize, inflict economic harm on, or limit commercial relations with a company because the company (a) engages in the exploration, production, utilization, transportation, sale, or manufacturing of fossil fuel-based energy and does not commit or pledge to meet environmental standards beyond applicable federal and state law, or (b) does business with a company described by paragraph (a)." See TEX. GOV'T CODE § 809.001(1).

Name of Company/Firm: _____

Mailing Address: _____

City/State/Zip: _____

Email Address: _____

Prepare By: _____

Company Official's Name: _____
Printed

Company Official's Authorized Signature: _____

TITLE _____

TELEPHONE NUMBER_____ DATE _____

Submit with Part 1

XXVII. EXHIBIT O – CERTIFICATION PROHIBITING DISCRIMINATION AGAINST FIREARM AND AMMUNITION INDUSTRIES

If (a) Vendor is not a sole proprietorship; (b) Vendor has at least ten (10) full-time employees; (c) this Agreement has a value of at least $100,000 that is paid wholly or partly from public funds; (d) the Agreement is not excepted under TEX. GOV'T CODE § 2274.003 of SB 19 (87th leg.); and (e) Owner has determined that Vendor is not a sole-source provider or Owner has not received any bids from a company that is able to provide this written verification, the following certification shall apply; otherwise, this certification is not required. Pursuant to TEX. GOV'T CODE Ch. 2274 of SB 19 (87th session), Vendor hereby certifies and verifies that Vendor, or association, corporation, partnership, joint venture, limited partnership, limited liability partnership, or limited liability company, including a wholly owned subsidiary, majority-owned subsidiary parent company, or affiliate of these entities or associations, that exists to make a profit, does not have a practice, policy, guidance, or directive that discriminates against a firearm entity or firearm trade association and will not discriminate during the term of this contract against a firearm entity or firearm trade association. For purposes of this Agreement, "discriminate against a firearm entity or firearm trade association" shall mean, with respect to the entity or association, to: "(1) refuse to engage in the trade of any goods or services with the entity or association based solely on its status as a firearm entity or firearm trade association; (2) refrain from continuing an existing business relationship with the entity or association based solely on its status as a firearm entity or firearm trade association; or (3) terminate an existing business relationship with the entity or association based solely on its status as a firearm entity or firearm trade association." See TEX. GOV'T CODE § 2274.001(3) of SB 19. "Discrimination against a firearm entity or firearm trade association" does not include: "(1) the established policies of a merchant, retail seller, or platform that restrict or prohibit the listing or selling of ammunition, firearms, or firearm accessories; and (2) a company's refusal to engage in the trade of any goods or services, decision to refrain from continuing an existing business relationship, or decision to terminate an existing business relationship to comply with federal, state, or local law, policy, or regulations or a directive by a regulatory agency, or for any traditional business reason that is specific to the customer or potential customer and not based solely on an entity's or association's status as a firearm entity or firearm trade association." See TEX. GOV'T CODE § 2274.001(3) of SB 19.

Name of Company/Firm: _____

Mailing Address: _____

City/State/Zip: _____

Email Address: _____

Prepare By: _____

Company Official's Name: _____
Printed

Company Official's Authorized Signature: _____

TITLE _____

TELEPHONE NUMBER_____ DATE _____

Submit with Part 1

XXVIII. EXHIBIT P – CERTIFICATION REGARDING CERTAIN FOREIGN-OWNED COMPANIES IN CONNECTION WITH CRITICAL INFRASTRUCTURE

Owner is prohibited from entering into a contract or other agreement relating to critical infrastructure that would grant to Vendor direct or remote access to or control of critical infrastructure in this state, excluding access specifically allowed by Owner for product warranty and support purposes. Vendor certifies that neither it nor its parent company nor any affiliate of Vendor or its parent company, is (1) owned by or the majority of stock or other ownership interest of the company is held or controlled by individuals who are citizens of China, Iran, North Korea, Russia, or a designated country; (2) a company or other entity, including governmental entity, that is owned or controlled by citizens of or is directly controlled by the government of China, Iran, North Korea, Russia, or a designated country; or (3) headquartered in China, Iran, North Korea, Russia, or a designated country. For purposes of this Agreement, "critical infrastructure" means "a communication infrastructure system, cybersecurity system, electric grid, hazardous waste treatment system, or water treatment facility." See TEX. GOV'T CODE § 2274.0101(2) of SB 1226 (87th leg.). Vendor verifies and certifies that Vendor will not grant direct or remote access to or control of critical infrastructure, except for product warranty and support purposes, to prohibited individuals, companies, or entities, including governmental entities, owned, controlled, or headquartered in China, Iran, North Korea, Russia, or a designated country, as determined by the Governor.

If Respondent is not a governmental body and (a) this Agreement has a stated expenditure of at least $1 million in public funds for the purchase of goods or services by the Owner; or (b) this Agreement results in the expenditure of at least $1 million in public funds for the purchase of goods or services by the Owner in a fiscal year of the Owner, the following certification shall apply; otherwise, this certification is not required. As required by Tex. Gov't Code § 552.374(b), the following statement is included in the RFP and the Agreement (unless the Agreement is (1) related to the purchase or underwriting of a public security; (2) is or may be used as collateral on a loan; or (3) proceeds from which are used to pay debt service of a public security of loan): "The requirements of Subchapter J, Chapter 552, Government Code, may apply to this RFP and Agreement and the contractor or vendor agrees that the contract can be terminated if the contractor or vendor knowingly or intentionally fails to comply with a requirement of that subchapter." Pursuant to Subchapter J, Chapter 552, Texas Government Code, the Respondent hereby certifies and agrees to (1) preserve all contracting information related to this Agreement as provided by the records retention requirements applicable to the Owner for the duration of the Agreement; (2) promptly provide to the Owner any contracting information related to the Agreement that is in the custody or possession of the Respondent on request of the Owner; and (3) on completion of the Agreement, either (a) provide at no cost to the Owner all contracting information related to the Agreement that is in the custody or possession of Respondent, or (b) preserve the contracting information related to the Agreement as provided by the records retention requirements applicable to the Owner.

Name of Company/Firm: _____

Mailing Address: _____

City/State/Zip: _____

Email Address: _____

Prepared By: _____

Company Official's Name: _____

Submit with Part 1

Printed

Company Official's Authorized Signature: _____

TITLE _____

TELEPHONE NUMBER_____ DATE _____

Submit with Part 1

XXIX. EXHIBIT Q – ANTITRUST CERTIFICATIONS STATEMENT (TEX. GOVERNMENT CODE § 2155.005)

I affirm under penalty of perjury of the laws of the State of Texas that:

1. I am duly authorized to execute this contract on my own behalf or on behalf of the company, corporation, firm, partnership or individual (Company) listed below;
2. In connection with this bid, neither I nor any representatives of the Company have violated any provision of the Texas Antitrust laws codified in Tex. Bus. & Comm. Code Chapter 15;
3. In connection with this bid, neither I nor any representative of the Company have violated any federal antitrust law; and
4. Neither I nor any representatives of the Company have directly or indirectly communicated any of the contents of this bid to a competitor of the Company or any other company, corporation, firm, partnership or individual engaged in the same line of business as the Company.

Name of Company/Firm: _____

Mailing Address: _____

City/State/Zip: _____

Email Address: _____

Prepared By: _____

Company Official's Name: _____
Printed

Company Official's Authorized Signature: _____

TITLE _____

TELEPHONE NUMBER_____ DATE _____

Submit with Part 1

XXX. EXHIBIT R – CONFLICT OF INTEREST DISCLOSURE STATEMENT

The Owner is required to comply with Texas Local Government Code Chapter 176, Disclosure of Certain Relationships with Local Government Officers. House Bill 23 significantly changed Chapter 176 as well as the required disclosures and the corresponding forms. As of September 1, 2015, any vendor who does business with the Owner or who seeks to do business with the Owner must fill out the new Conflict of Interest Questionnaire (CIQ) whether or not a conflict of interest exists. A conflict of interest exists in the following situations:

1. If the vendor has an employment or other business relationship with a local government officer of the Owner or a family member of the officer, as described by section 176.003(a)(2)(A) of the Texas Local Government Code; or
2. If the vendor has given a local government officer of the Owner, or a family member of the officer, one or more gifts with the aggregate value of $100, excluding any gift accepted by the officer or a family member of the officer if the gift is: (a) a political contribution as defined by Title 15 of the Election Code; or (b) a gift of food accepted as a guest; or
3. If the vendor has a family relationship with a local government officer of the Owner.

"Vendor" means a person who enters or seeks to enter into a contract with a local governmental entity. The term includes an agent of a vendor. The term includes an officer or employee of a state agency when that individual is acting in a private capacity to enter into a contract. The term does not include a state agency except for Texas Correctional Industries. *Texas Local Government Code 176.001(7).*

"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. *Texas Local Government Code 176.001(3).*

"Family relationship" means a relationship between a person and another person within the third degree by consanguinity or the second degree by affinity, as those terms are defined by Subchapter B, Chapter 573, Government Code. *Texas Local Government Code 176.001(2-a).*

"Local government officer" means: (A) a member of the governing body of a local governmental entity; (B) a director, superintendent, administrator, president, or other person designated as the executive officer of a local governmental entity; or (C) an agent of a local governmental entity who exercises discretion in the planning, recommending, selecting, or contracting of a vendor. *Texas Local Government Code 176.001(4).*

Owner Board of Trustees include:
Mr. Mark Lewandowski, Mr. John McStravick, Dr. Michael Pratt, Mrs. Amanda Bass, Mrs. Jennifer Kratky, Mr. Coco White, Mr. Patrick Beecher

Owner Superintendent: Dr. Martha Salazar-Zamora

Current local government officers include, but are not limited to:
Dr. Amy Schindewolf, Dr. Michael Webb, Dr. Steven Gutierrez, Mrs. Holly Sherman, Mr. Zack Boles

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.
In the event of changed circumstances, an updated CIQ must be filed within seven (7) business days after the vendor becomes aware that a conflict of interest exists.

Submit with Part 1

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.

Form provided by Texas Ethics Commission www.ethics.state.tx.us Revised 1/1/2021

XXXI. EXHIBIT S – BID ALTERNATES AND UNIT PRICE FORM

Alternates: If the Owner elects to accept any or all of the Alternates, the undersigned agrees to modify the Base Proposal as stipulated. **Circle Add or Deduct** for each Alternate below.

Alternate NO. 1: Section 23 6426 - Rotary-Screw Water Chillers - Owner will select one alternate from Alternates 1A – 1C to be included with the Base Proposal. Do not include Rotary-Screw Water Chillers in the Base Proposal.

Alternate NO. 1A: Provide Rotary-Screw Water Chillers as manufactured by Carrier Corporation as specified and as shown on the drawings.

Add/Deduct _____Dollars

(Amount written in words governs)

$_____(Amount in figures)

Alternate NO. 1B: Provide Rotary-Screw Water Chillers as manufactured by Trane Technologies, PLC as specified and as shown on the drawings.

Add/Deduct _____Dollars

(Amount written in words governs)

$_____(Amount in figures)

Alternate NO. 1C: Provide Rotary-Screw Water Chillers as manufactured by Dunham Bush as specified and as shown on the drawings.

Add/Deduct _____Dollars

(Amount written in words governs)

$_____(Amount in figures)

Alternate NO. 2: Section 23 7313 – Modular Central-Station Air-Handling Units - Owner will select one alternate from Alternates 2A – 2C to be included with the Base Proposal. Do not include Modular Central-Station Air-Handling Units in the Base Proposal.

Alternate NO. 2A: Provide Modular Central-Station Air-Handling Units as manufactured by Carrier Corporation as specified and as shown on the drawings.

Add/Deduct _____Dollars

(Amount written in words governs)

$_____(Amount in figures)

Alternate NO. 2B: Provide Modular Central-Station Air-Handling Units as manufactured by Trane Technologies, PLC as specified and as shown on the drawings.

Add/Deduct _____Dollars

(Amount written in words governs)

$_____(Amount in figures)

Alternate NO. 2C: Provide Modular Central-Station Air-Handling Units as manufactured by Temptrol as specified and as shown on the drawings.

Add/Deduct _____Dollars

(Amount written in words governs)

$_____(Amount in figures)

Alternate NO. 3: Section 23 0923 – Direct-Digital Control Devices for HVAC - Owner will select one alternate from Alternates 3A – 3B to be included with the Base Proposal. Do not include Direct-Digital Control Devices for HVAC in the Base Proposal.

Alternate NO. 3A: Provide Direct-Digital Control Devices for HVAC as manufactured by Automated Logic as specified and as shown on the drawings.

Add/Deduct _____Dollars

(Amount written in words governs)

$_____(Amount in figures)

Alternate NO. 3B: Provide Direct-Digital Control Devices for HVAC as manufactured by Unified Controls as specified and as shown on the drawings.

Add/Deduct _____Dollars

(Amount written in words governs)

$_____(Amount in figures)

Alternate NO. 4: Provide PEX piping in lieu of 1-1/2" Pipe and Below Copper piping.

Add/Deduct _____Dollars

(Amount written in words governs)

$_____(Amount in figures)

Alternate NO. 5: Provide Striping with Fire Turning Circle as specified and as shown on the drawings.

Add/Deduct _____Dollars

(Amount written in words governs)

$_____(Amount in figures)

Alternate NO. 6: Provide optional adjustment to Base Proposal.

Add/Deduct _____Dollars

(Amount written in words governs)

$_____(Amount in figures)

Unit Price: The undersigned further agrees that in case adjustments to the work or material is authorized from what is shown in the Contract the following unit prices will be used in adjusting the Contract Price. The Contract Price shall be subject to increase or decrease based upon the actually accepted quantities performed multiplied by the current contract unit prices. Work shall be in conformance with the Contract Documents. If unit price shall be used, then payment for all items will be on a unit price basis, unless listed otherwise in the Proposal Form. The unit price and payment made for each item listed shall constitute full compensation for furnishing all plant, labor, materials, and equipment, and performing any associated Contractor quality control, environmental protection, meeting safety requirements, tests and reports, and for performing all Work required for each of the unit price items. Contract unit price multiplied by agreed quantity is full compensation and includes Overhead, field overhead, and profit.

UNIT PRICE 1: ELECTRICAL DUPLEX RECEPTACLE

Provide unit price for a new 20A, 120V duplex electrical receptacle and cover plate, flush mounted in a CMU, metal stud, or demountable wall construction, circuited to an existing electrical panel within 150 feet of the outlet using a branch circuit consisting of 2 #10 AWG and 1 #10 AWG ground in 3/4 inch EMT conduit. All conduits to be concealed in wall construction. Unit price shall include a 20 amp circuit breaker to be installed in existing panel space.

$_____ each

UNIT PRICE 2: DATA DROP

Provide unit price for a data drop, flush mounted in a CMU, metal stud or demountable wall construction., wired to an IDF/MDF Room. The data drop shall consist of a single gang wall box, cabling wiring device, cover plate, 3/4 inch conduit from outlet to above accessible ceiling, plenum-rated cabling routed above accessible ceiling to the nearest MDF or IDF location within 250 feet of the outlet. Termination and testing to be included in the unit price.

$_____ each

UNIT PRICE 3: VOICE DROP

Provide unit price for a voice drop, flush mounted in a CMU, metal stud or demountable wall construction., wired to the telecommunications/MDF room. The voice drop shall consist of a single gang wall box, voice jack, cover plate, 3/4 inch conduit from outlet to above accessible ceiling, plenum-rated voice cable routed above accessible ceiling to telecommunication head end equipment. Termination and testing to be included in the unit price.

$_____ each

UNIT PRICE 4: 4 ½" THICK CONCRETE WALK PER SQUARE FOOT

This unit cost shall establish the amount to the contract price for the Contractor to add or deduct 4 ½" thick concrete walk (minimum 100 SF) per Square Foot.

$_____ each

UNIT PRICE 5: 7" THICK CONCRETE DRIVE PER SQUARE FOOT

This unit cost shall establish the amount to the contract price for the Contractor to add or deduct 7" thick concrete drive (minimum 100 SF) per Square Foot.

$_____ each

UNIT PRICE 6: LIFE SAFETY DEVICES (including all associated cabling and programming)

This unit cost shall establish the amount to be added or deducted from the contract price for the Contractor to add /deduct Fire Alarm devices.

1. Exterior Horn To Speaker $_____ each
2. Interior Horn To Speaker $_____ each
3. Interior Visual Strobe $_____ each
4. Interior Speaker/Visual Strobe $_____ each
5. Smoke Detector $_____ each
6. Heat Detector $_____ each
7. Manual Pull Station $_____ each
8. Stopper 2 Pull Station Cover $_____ each
9. Annunciator Panel $_____ each
10. Duct Detector $_____ each
11. Relay $_____ each
12. Supervisory $_____ each
13. Waterflow $_____ each
14. Amplifier $_____ each
15. Remote Power Supply $_____ each

UNIT PRICE 7: 4" RESILIENT BASE 100 LINEAR FEET

This unit cost shall establish the amount to be added or deducted to the contract price for the Contractor to properly remove existing base and install 4" resilient base.

$_____ each

UNIT PRICE 8: GRAPHIC SIGNS

This unit cost shall establish the amount to be added or deducted to the contract price for the Contractor to remove existing signage and install new as described below:

1. Sign Type A $_____ each
2. Sign Type B $_____ each
3. Sign Type C $_____ each
4. Sign Type D $_____ each
5. Sign Type E $_____ each
6. Sign Type F $_____ each
7. Max Occupancy Signage $_____ each
8. FDC Connection Signage $_____ each
9. Wayfinding Signage (2 lines text) $_____ each
10. Wayfinding Signage (3 lines text) $_____ each
11. Wayfinding Signage (4 lines text) $_____ each

UNIT PRICE 9: EXIT SIGN

This unit cost shall establish the amount to be added to the contract price to provide and install one (1) exit sign. Price shall include wiring to nearest available emergency circuit, up to 200 feet.

$_____ each

UNIT PRICE 10: SECURITY FILM

This unit cost shall establish the amount to be added to the contract price to provide and install security film on existing exterior glazing (minimum 200 square feet).

1. Armor Glass $_____ Square foot
2. Saint Gobain $_____ Square foot
3. 3M $_____ Square foot

UNIT PRICE 11: Topsoil

Each 1,000 square yards of prepared topsoil, 2" uniform depth

$_____ Square yard

Unit Price NO. 12: Backfill Offsite Sources

Each cubic yard of backfilling, meeting fill requirements of construction documents, compacted in lifts as required by construction documents.

$_____ Cubic yard

Unit Price NO. 13: Backfill Onsite Sources

Each cubic yard of backfilling, meeting fill requirements of construction documents, compacted in lifts as required by construction documents.

$_____ Cubic yard

Unit Price NO. 14: Concrete Poured from Truck

Each cubic yard structural concrete, off the truck, no pumping, placement, or finishing. as required by construction documents.

$_____ Cubic yard

Unit Price NO. 15: Concrete Pumped

Each cubic yard structural concrete, as required by construction documents.

$_____ Cubic yard

Unit Price NO. 16: Concrete Grout Pumped

Each cubic yard concrete grout, as required by construction documents.

$_____ Cubic yard

Unit Price NO. 17: 24" Diameter Auger Cast Grout Piles

Each linear foot of 24" diameter auger cast grout piles complete including grout, accessories, & drilling.

$_____ Linear Foot

Submit with Part 2

Company Name:_____

Unit Price NO. 18: Concrete Masonry Units

Each unit of concrete masonry units, as required by construction documents.

$_____ Units

Unit Price NO. 19: Reinforcing Steel, Straight or Bent

Pound weight of reinforcing steel, straight or bent, as required by the Contract Documents.

$_____ Pound

Unit Price NO. 20: Structural Steel

Pound weight of structural steel as required by the Contract Documents.

$_____ Ea.

Company:_____

Address:_____

City ST Zip

Telephone:_____ Fax:_____ Email:_____

Printed Name/Title:_____ Signature:_____

State whether firm is a: ❒ Corporation ❒ Partnership ❒ Individual

Submit with Part 2 **Company Name:_____**

XXXII. EXHIBIT T – KEY SUBCONTRACTORS

List the following top (3) Subcontractors for each discipline listed below providing their all-inclusive price to allow for a net add or deduct for the Owner's review. The number one subcontractor shall be the one used within the base bid. Number two shall be the 2nd bidder and so on. The Owner reserves the right to select either of the three or discard all to seek another Subcontractor or Vendor bid.

Ranked Discipline	**Name of Company**	**$_____**
Structural Concrete		
	#1 _____	$_____
	#2_____	$_____
	#3_____	$_____
Mechanical		
	#1_____	$_____
	#2_____	$_____
	#3_____	$_____
Electrical		
	#1_____	$_____
	#2_____	$_____
	#3_____	$_____
Plumbing		
	#1_____	$_____
	#2_____	$_____
	#3_____	$_____
Roofing		
	#1_____	$_____
	#2_____	$_____
	#3_____	$_____

Submit with Part 2 **Company Name:_____**

Data Cabling

#1 _____ $_____

#2_____ $_____

#3_____ $_____

Fire Alarm

#1_____ $_____

#2_____ $_____

#3_____ $_____

Building Automation

#1_____ $_____

#2_____ $_____

#3_____ $_____

Self-Performed Work

List All Self-Performed Work. Provide Pricing for Subcontractors for the same Work Scope.

#1_____ $_____

#2_____ $_____

#3_____ $_____

XXXIII. EXHIBIT U – PREVAILING WAGE RATES

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.

Prevailing Wage Rates – School Construction Trades

June 2, 2025

Texas Gulf Coast Area

CLASSIFICATION	2025 HOURLY RATE
ASBESTOS WORKER	$27.20
BRICKLAYER; MASON	$24.90
CARPENTER; CASEWORKER	$23.13
CARPET LAYER; FLOOR INSTALLER	$26.20
CONCRETE FINISHER	$23.83
DATA COMM/TELE COMM	$24.33
DRYWALL INSTALLER; CEILING INSTALLER	$24.33
ELECTRICIAN	$29.86
ELEVATOR MECHANIC	$39.78
FIREPROOFING INSTALLER	$22.99
GLAZIER	$23.25
HEAVY EQUIPMENT OPERATOR	$22.17
INSULATOR	$21.95
IRONWORKER	$26.50
LABORER, HELPER	$19.81
LATHERER; PLASTERER	$22.75
LIGHT EQUIPMENT OPERATOR	$28.75
METAL BUILDING ASSEMBLER	$24.00
PAINTER; WALL COVERING INSTALLER	$20.17
PIPEFITTER	$29.82
PLUMBER	$27.98
ROOFER	$22.50
SHEET METAL WORKER	$29.96
SPRINKLER FITTER	$23.00
STEEL ERECTOR	$26.00
TERRAZZO WORKER	$22.75
TILE SETTER	$22.00
WATERPROOFER; CAULKER	$24.00

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

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.
PAINTER; WALL COVERING INSTALLER	Worker who prepares wall surfaces and applies paint and/or wall 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
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.

3 of 3

XXXIV. EXHIBIT V – AIA DOCUMENT A101-2017, AND EXHIBITS

DRAFT

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 « September » in the year «2026 »
(In words, indicate day, month and year.)

BETWEEN the Owner:
(Name, legal status, address and other information)

«Tomball Independent School District »« »
«310 S. Cherry Street »
«Tomball, Texas 77375 »
« »

and the Contractor:
(Name, legal status, address and other information)

for the following Project:
(Name, location and detailed description)

«RFP-CSP #1003-26
New Tomball Intermediate School
11211 FM 2920
Tomball, TX 77375»

The Architect:
(Name, legal status, address and other information)

«Huckabee Architects
1700 City Plaza Dr., Suite 125
Spring, TX 77389
« »

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.

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.

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TABLE OF ARTICLES

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2 THE WORK OF THIS CONTRACT

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EXHIBIT A INSURANCE AND BONDS

ARTICLE 1 THE CONTRACT DOCUMENTS

§ 1.1 The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), all sections of the Project Manual, including RFP, Drawings, Specifications, and Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and written Modifications signed by both parties that are 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. As used in the Contract Documents, the terms "AIA Document A201 – 2017", "General Conditions", "General Conditions of the Contract for Construction" or "A201-2017" shall refer to the General Conditions document that pertains to the Project, as modified or amended by the Owner for the project. This Agreement represents the entire and integrated agreement between the Owner and the Contractor 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. In the event of conflict, terms and conditions contained in the Agreement shall take precedence over terms and conditions contained in the General Conditions, and the terms and conditions in the General Conditions, shall take precedence over all other terms and conditions contained in the other Contract Documents. If the Request for Proposals and the Proposal are included in the Contract Documents, then the Request for Proposals shall take precedence over the Proposal, unless specifically agreed otherwise herein.

§ 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 or amend a contract, to approve and execute a Change Order valued at or above $50,000 or Construction Change Directive that would increase the Contract Sum more than $50,000, or to agree to an extension to the date of Substantial or Final Completion.

§ 1.3 The Board designates the authorized representatives identified in Paragraph 8.3 to act on its behalf in other respects.

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.)

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[« »] The date of this Agreement.

[« »] A date set forth in a notice to proceed issued by the Owner.

[«X»] Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

« The date of commencement shall be the day that the Contractor receives a Notice to Proceed from the Owner, which may precede the date of execution of this Agreement. If a Building Permit is not available or other approvals are not available for the entire Project, the Contractor must commence work on those portions of the Project that do not require a Building Permit or other approvals on receipt of a Notice to Proceed. Work at the Project site shall not begin until Owner has received all required payment and performance bonds and insurance.»

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 and Final 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.)

[« »] 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 or Final Completion as provided in this Section 3.3, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

§ 3.3.4 Subject to adjustments of the Contract Time as provided in the Contract Documents, Final Completion shall be **30** calendar days after the date of Substantial Completion.

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 **Dollars and no Cents ($)**, which includes a **Dollars and no Cents ($)**, Owner Contingency, 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.

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(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
Owner Controlled Contingency	$3,000,000.00
Traffic Signal	$ 500,000.00

§ 4.3.1 The Contract Sum contains an Owner's Contingency / Owner Betterment Allowance. This contingency is for the sole use of the Owner to be used for changes in the scope of the Work and for the betterment of the Project. Owner's authorized representative may approve any expenditure from Owner's Contingency without further Board approval. If the Owner's Contingency is not expended or not fully expended, then any unused portion shall belong to the Owner and shall be credited to the Owner in calculating final payment.

§ 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)

§ 4.5 Liquidated damages, if any:
(Insert terms and conditions for liquidated damages, if any.)

« Refer to AIA A201, as modified by the Owner for the project, for Liquidated Damages »

§ 4.6 Other:
(Insert provisions for bonus or other incentives, if any, that might result in a change to the Contract Sum.)

« »

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 The Contractor shall submit monthly Applications for Payment to both the Architect and Program Manager, if applicable, on AIA Form G702 for approval. Continuation sheets shall be submitted on AIA Form G703. If the Architect and Program Manager, if applicable, approve the application, then they shall submit a Certificate for Payment to the Owner. The Architect and Program Manager, if applicable, may require any additional information deemed necessary and appropriate to substantiate the Application for Payment. Materials that are verified to be on the jobsite or other approved location for use in the Project may also be incorporated into the Application for Payment. The Architect and Program Manager, if applicable, shall have seven (7) days from date of receipt from the Contractor of an Application for Payment to approve or reject all or any part of the Application for Payment. The Owner shall pay the undisputed amounts certified by the Architect and Program Manager, if applicable, to the Contractor within thirty (30) days of receipt of the Certificate for Payment from the Architect and Program Manager, if applicable, unless otherwise provided in the Contract Documents. Undisputed amounts unpaid after the date on which payment is due shall bear interest pursuant to Texas Government Code Section 2251.025.

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§ 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, less any unused Owner's contingency, 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, but shall contain as a minimum, individual line items for each section of the table of contents of the Project Manual separated by material costs and labor costs. Additionally, General Conditions costs shall be separated into individual line items. Each Application for Payment shall also include a list, with backup data, of how each payment shall be spent, including a list detailing which subcontractors and suppliers will be paid out of funds paid by the Owner and the amount of such payments to subcontractors and suppliers. Additionally, beginning with the second application for payment, proof of each payment to Contractor's subcontractors and suppliers for payment within 61-days after payment. The Application for Payment shall be submitted on a schedule of values basis. 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, as modified by the Owner for the project, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be provided using the AIA G702 and G703 format and 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, as modified by the Owner for the project;

.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 as modified by the Owner for the project; and

.5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.6.3 If Owner is entitled to deduct liquidated damages, or any other damages or amounts provided in the Contract Documents, including clean-up fees, then Owner shall be entitled to deduct such liquidated damages, amounts and fees at any time.

§ 5.1.6.4 If Contractor fails or refuses to complete the Work, or has unsettled claims with Owner, any payment to Contractor shall be subject to deduction for such amounts as the Architect and Program Manager, if applicable, shall determine as the cost for completing incomplete Work and the value of unsettled claims.

§ 5.1.6.5 Payments shall be made on account of materials and equipment (a) incorporated in the Work, (b) suitably stored at the Project site, or (c) 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 The surety must agree, in writing, to each request for payment; and

.4 The Contractor must bear the cost of the Owner's and Architect's expenses related to visiting the off-site storage area.

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Payment for materials and/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 and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance (naming the Owner as additional 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

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Final 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%) »

§ 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.)

No reductions are allowed unless approved by the Owner prior to any billing.

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, upon Final 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 Final Completion shall not include retainage as follows:
(Insert any other conditions for release of retainage upon Final Completion.)

« »

§ 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 payable in accordance with Article 9 of AIA Document A201–2017, as modified by the Owner for the Project.

§ 5.1.9 Except with the Owner's prior written approval or as otherwise provided in in Section 9.3.2 of the AIA Document A201-2017, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site. If the Contractor wishes to bill for materials or equipment which cannot be stored on site, the Contractor shall, along with the request for approval, provide evidence of purchase, evidence of delivery in good order without damage, and a certificate of insurance specifically covering the material identified by way of serial numbers, bill of lading, and copy of signature of receipt of materials and photography showing material. The Contractor shall also require, at the Owner's request, proof that the facility at which the materials or equipment is stored is bonded. Security and protection from theft and damage remains on the Contractor as the first line of accountability and financial responsibility. Delays due to issues arising from stored materials shall not be considered as reasonable justification to release the Contractor from meeting the schedule unless the Owner agrees to such delay in writing in advance of any delay.

§ 5.2 Final Payment

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, minus disputed sums, authorized deductions, and liquidated damages, shall be made by the Owner to the Contractor after

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct nonconforming Work as provided in Article 12 of AIA Document A201–2017, as modified by the Owner for the project, and to satisfy other requirements, if any, which extend beyond final payment;

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.2 the Contractor has provided all documents required by Section 3.5 et seq. and 9.10.2 of AIA Document A201-2017; and

.3 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 45 days after Owner's Board's vote or other required approval pursuant to applicable policy. Undisputed amounts unpaid after the date on which payment is due shall bear interest pursuant to Texas Government Code Section 2251.025.

« »

§ 5.3 Interest

Payments due and unpaid under the Contract shall bear interest at the rate established by Texas Government Code Chapter 2251.

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, as modified by the Owner for the project, 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.)

«N/A »
« »
« »
« »

§ 6.2 Binding Dispute Resolution

For any Claim or dispute between the parties, 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, as amended by the Owner for the Project.

§ 7.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A201–2017, as amended by the Owner for the project, 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.)

«As described in AIA Document A201-2017, as amended by the Owner for the project. »

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2017, as amended by the Owner for the project.

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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 Designated representative:
(Name, address, email address, and other information)
The Owner's Board of Trustees, by majority vote at a duly noticed and lawfully called public meeting, is the only representative of Owner, a Texas independent school district organized under the laws of the State of Texas, having the power to enter into a contract, to execute a change order in an amount of $50,000 or more, or to agree to an extension to the contractual completion date, unless this authority is lawfully delegated. The Board may designate in writing an authorized representative (or representatives), as appropriate, to act on its behalf during the course of construction. Such authorized representative shall have authority to act on behalf of the Owner concerning decisions that do not require a majority vote of the Board of Trustees and shall have the authority to bind the Owner only to the extent expressly authorized or delegated by the Board of Trustees. The authorized representative shall have no implied authority. Such authorized representative shall also bring recommendations to the Board of Trustees on any matter requiring Board approval. In the event that changes in the scope of the Work are required before the Board's next regularly scheduled meeting or in order to facilitate and expedite the timely completion of the Work, the Board's authorized representative shall have authority to approve construction changes that do not exceed $50,000.00 in increased costs. Any such change shall be confirmed in writing between the Contractor and the Board's authorized representative and notice of such approved changes shall be given to the Board at its next regularly scheduled meeting. The Board shall act as soon as reasonably possible to avoid unnecessary delays in the construction completion date. Except as expressly authorized by the Owner or the Contract Documents, the Architect does not have the authority to bind the Owner. The term "Owner" means the Owner or the Owner's authorized representative.

§ 8.3 The Owner's authorized representative:

Superintendent of Schools or their designee
Mr. Mitchell Lee, Executive Director of Maintenance and Construction Projects
Tomball ISD Ancillary Services Building, Room 112
1110 Baker Drive
Tomball, TX 77375
»« »

§ 8.3 The Contractor's representative:
(Name, address, email address, and other information)

« »

§ 8.4 The Contractor's representative shall not be changed without ten days' prior notice and acceptance by the Owner.

§ 8.5 Insurance and Bonds
§ 8.5.1 The Contractor shall purchase and maintain insurance as set forth in 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 All notices required to be given under the Contract must be in writing. Any notice required or permitted to be given under the Contract shall be deemed delivered, whether or not actually received, three days after it is deposited in the U.S. Mail, when sent by certified mail, return receipt requested, postage prepaid, and correctly addressed to the party at the address provided in this Agreement. Notice given in any other manner shall be deemed delivered when actually received. Either party may change its address for notice by giving notice of the change of address in accordance with this provision. The Architect must be copied on notices sent to the Owner.

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§ 8.7 Other provisions:

« »

§ 8.7.1 The subject of this Contract is a public school facility which is governed by School Facilities Standards promulgated by the State Board of Education and said project must be constructed in compliance with these Standards. Upon request, Owner, its authorized agent, its Architect, and/or its Engineer shall make available information related to the School Facilities Standards necessary for compliance with said Standards.

§ 8.7.2 The Owner is an organization exempt from Texas taxes. Owner shall not be responsible for sales, consumer, use, and similar taxes on labor, materials, equipment, systems, and other items purchased for the project which Owner would ordinarily be exempt.

§ 8.7.3 All provisions in the Contract Documents that mandate arbitration are expressly deleted and rendered null and void.

§ 8.7.4 Subcontracts, purchase orders and rental agreements entered into by the Contractor shall contain provisions permitting assignment to the Owner upon default by Contractor under the Contract Documents. If the Owner accepts such assignment, the Owner shall be responsible for the payment of amounts which would have been reimbursable to Contractor under this Agreement and for which payment has not already been made to the Contractor. Contractor shall be responsible for the payment of any other amounts payable under the Contract. If the Owner elects not to accept the assignment of any subcontract, purchase order or rental agreement which would have constituted a Cost of the Work had this agreement not been terminated, the Contractor shall terminate such subcontract, purchase order or rental agreement.

§ 8.7.5 Unless the context of this Agreement otherwise clearly requires, references to the plural include the singular, the term "including" is not limiting and the terms "hereof," "herein," "hereunder" and similar terms in the Contract Documents refer to the Contract Documents as a whole and not to any particular provision thereof, unless stated otherwise. Additionally, the parties hereto acknowledge that they have carefully reviewed this Agreement and have been advised by counsel of their choosing with respect thereto, and that they understand its contents and agree that this Agreement shall not be construed more strongly against any part hereto regardless of who is responsible for its preparation.

§ 8.7.6 In the event of any suit or action arising out of or in connection with any of the Contract Documents, the prevailing party in such proceedings shall be entitled to recover reasonable attorney fees and court costs.

§ 8.7.7 Any provision in the Contract Documents to the contrary notwithstanding, if any of the facilities to be constructed or modified under this Agreement or the Contract require the issuance of a Certificate of Occupancy or other regulatory approval, then Substantial Completion of any such facilities shall not be deemed to have been attained for those facilities prior to the date on which an unconditional Certificate of Occupancy or other regulatory approval is obtained.

§ 8.7.8 If the building will be used or occupied by the Owner or members of the public, the Contractor shall be responsible for maintaining safe routes of travel from sidewalks and parking areas to the building, and shall reroute access as necessary to maintain safe access during construction at no additional cost beyond the agreed contract amount.

§ 8.7.9 By signing this Agreement or providing or causing to be provided a certificate of coverage, the Contractor is certifying to the Owner 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. Contractor is also representing that it will require all subcontractors to provide workers' compensation coverage on all employees who will provide services on the Project for the duration of the Project and to provide written certifications of such coverage to the Contractor. The Contractor will provide the certifications to Owner. Providing false or misleading information may subject the Contractor to administrative penalties, criminal penalties, civil penalties, or other civil actions. The Contractor's failure to comply with any of these provisions is a breach of contract by the Contractor which entitles the Owner to declare the contract void if the Contractor does not remedy the breach within ten days after receipt of notice of breach from the Owner.

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§ 8.7.10 The Contractor shall, as a condition precedent to allowing any subcontractor to proceed with any work on the Project, either require that the subcontractor provide proof of the existence of workers' compensation coverage for its employees, or, at the Contractor's sole discretion, provide for coverage of the subcontractor's employees under the Contractor's workers' compensation insurance coverage. The Contractor shall maintain records of all required certificates of insurance provided by the subcontractors, and shall forward copies to the Owner and the Architect.

§ 8.7.11 Warranty. The Contractor shall be responsible for the coordination of warranty work, if any during the first year after Substantial Completion of the Entire Work. Where a return warranty call is made for the same item more than (3) times in no more than (45) calendar days, the warranty shall be extended day for day beyond Substantial Completion plus the number of calendar days prior to a continuous period of (30) calendar days with no claims.

§ 8.7.12 No provision of this Agreement shall waive any immunity or defense. No provision of this Agreement is a waiver of any immunity or a consent to suit.

§ 8.7.13 The Owner's competitive procurement solicitation documents/packet and the response of the Contractor to same are incorporated herein by reference as if copied verbatim. The Contractor agrees to comply with all requirements incorporated or included in the competitive procurement solicitation documents/packet by the Owner

§ 8.7.14 The Contractor shall record the progress of the Project. On a monthly basis, or as otherwise agreed to by the Owner, the Contractor shall submit written progress reports to the Owner and Architect, showing percentages of completion and other information required by the Owner. The Contractor shall also keep, and make available to the Owner and Architect, a daily log containing a record for each day of weather, portions of the Work in progress and accomplished, Subcontractors working on the site, number of workers on site, identification of equipment on site, problems that might affect progress of the work, accidents, injuries, and other information required by the Owner. The log shall be available to the Owner and Architect at any time during work hours and shall be presented for discussion at the project progress meetings.

§ 8.7.15 If (a) Contractor is not a sole proprietorship; (b) Contractor has ten (10) or more full-time employees; and (c) this Agreement has a value of $100,000 or more, the following certification shall apply; otherwise, this certification is not required. Pursuant to Chapter 2270 of the Texas Government Code, the Contractor hereby certifies and verifies that neither the Contractor, nor any affiliate, subsidiary, or parent company of the Contractor, if any (the "Contractor Companies"), boycotts Israel, and the Architect agrees that the 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 refusing to deal with, terminating business activities with, 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, but does not include an action made for ordinary business purposes.

§ 8.7.16 Contractor verifies and affirms that it is not a foreign terrorist organization as identified on the list prepared and maintained by the Texas Comptroller of Public Accounts. If Contractor misrepresents its inclusion on the list, then such omission or misrepresentation shall void this Agreement.

§ 8.7.17 If Contractor is not a governmental body and (a) this Agreement has a stated expenditure of at least $1 million in public funds for the purchase of goods or services by Owner; or (b) this Agreement results in the expenditure of at least $1 million in public funds for the purchase of goods or services by Owner in a fiscal year of Owner, the following certification shall apply; otherwise, this certification is not required. As required by Tex. Gov't Code § 552.374(b), the following statement is included in the RFP and the Agreement (unless the Agreement is (1) related to the purchase or underwriting of a public security; (2) is or may be used as collateral on a loan; or (3) proceeds from which are used to pay debt service of a public security of loan): "The requirements of Subchapter J, Chapter 552, Government Code, may apply to this RFP and Agreement and the Contractor agrees that the Contract can be terminated if the Contractor knowingly or intentionally fails to comply with a requirement of that subchapter." Pursuant to Subchapter J, Chapter 552, Texas Government Code, the Contractor hereby certifies and agrees to (1) preserve all contracting information related to this Agreement as provided by the records retention requirements applicable to Owner for the duration of the Agreement; (2) promptly provide to Owner any contracting information related to the Agreement that is in the custody or possession of the Contractor on request of Owner; and (3) on completion of the Agreement, either (a) provide at no cost to Owner all contracting information related to the Agreement that is in the custody or possession of Contractor, or (b) preserve the contracting information related to

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the Agreement as provided by the records retention requirements applicable to Owner.

§ 8.7.18 Program Manager shall have, and is hereby granted by Owner, full and complete power, authority, and discretion to act for, and in the name, place, and stead of, Owner in carrying out and discharging the responsibilities and obligations of Program Manager under the Agreement between the Owner and Program Manager; provided, however, that Program Manager shall have no right or authority, express or implied, to commit or otherwise obligate Owner in any manner whatsoever except to the extent specifically provided in the Agreement between the Owner and the Program Manager or specifically authorized in writing by Owner. In no event shall Program Manager be authorized to execute any documents, agreements, or other instruments on behalf of Owner without written approval by Owner. In no event shall Program Manager have the authority to modify completion dates of the Project Schedule without written approval by Owner. Program Manager shall have the authority to modify interim milestones dates not affecting the completion dates specified in the Agreements between the parties. In no event shall Program Manager have the authority to modify contract value of the Project without written approval by Owner. Program Manager shall have the authority to modify budgets, contingencies, allowances and similar accounting tasks not affecting the contract value specified in the Agreements between the parties. In no event shall Program Manager have the authority to relax or to bind the Owner to codes and standards imposed by the Authorities Having Jurisdiction, unless authorized in writing by the Owner.

§ 8.7.19 The Contractor shall utilize online project management software in the manner described in Exhibit C Project Management Software.

§ 8.8 Governing Law and Venue

§ 8.8.1 Section 13.1 of the General Conditions document pertaining to the Project, as modified by the Owner, shall apply to the Agreement, the Contract, and the Contract documents in all respects. No provision of this Agreement is a waiver of any immunity, defense, or a consent to suit.

§ 8.8.2 Venue

To the maximum extent permitted by applicable law, the parties expressly agree that the exclusive venue and place of trial for any action brought under or in connection with or in any way related to the Work, the Project, the Agreement, the Contract, or any of the Contract Documents shall be in the state district courts of Harris County, Texas, and the parties hereby waive any and all objections to the agreed-upon venue as stated herein. The Contract, including but not limited to the Agreement and all other Contract Documents, is performable entirely in Harris County, Texas.

§ 8.9 Severability

If any provision or part of the Contract Documents is held to be illegal, invalid, or unenforceable under any present or future law or regulation, such provision shall be fully severable and the Contract Documents shall be construed and enforced as if such illegal, invalid or unenforceable provision had never comprised a part of the Contract Documents. The remaining provisions of the Contract Documents shall remain in full force and effect and shall not be affected by the illegal, invalid, or unenforceable provision or by its severance.

§ 8.10 Information and Services Required of the Owner

§ 8.10.1 Pursuant to the requirements of the Texas Business and Commerce Code section 56.054(e)(3), the Owner represents that funds are available and have been authorized for the full contract amount of the work.

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, as modified by Owner for the Project
- **.2** AIA Document A201™–2017, General Conditions of the Contract for Construction, as modified by the Owner for the project
- **.3** 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.)
- .4 Exhibit A - Insurance and Bonds
- .5 Exhibit B -Bid Form A – With Unit Prices

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.6 Exhibit C – Project Management Software

« »

.5 Drawings

Number	Title	Date
« As defined in the Architects Drawing Index. Additionally, revisions shall be considered included in this agreement where revisions were made during bidding and issued by the Architect as an official addendum and acknowledged as received on bid day by the Contractor. »		As dated when issued for bid

.6 Specifications

Section	Title	Date	Pages
As defined in the Architects Project Manual Table of Contents. Additionally, revisions shall be considered included in this agreement where revisions were made during bidding and issued by the Architect as an official addendum and acknowledged as received on bid day by the Contractor.		As dated when issued for bid	

.7 Addenda, if any:

Number	Date	Pages
«Addendum #01 »		As provided in the official posting, typical in all cases.
«Addendum #02 » Addendum #03		

Portions of Addenda relating to bidding or competitive purchasing requirements are not part of the Contract Documents unless the bidding or competitive purchasing 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.)

[« X »] None

« »

Title	Date	Pages
«None »		

[« »] Supplementary and other Conditions of the Contract:

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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.)

« »

.1 Owner's competitive procurement solicitation documents and Contractor's responses and proposals to same.

.2 The Project Manual for the Project, including all sections to same, whether issued or created prior to or after the execution of this Agreement.

.3 Statutory Payment and Performance Bonds.

.4 Certificates of Insurance required of the Contractor.

.5 All documents listed or described in Section 1.1.1 of AIA Document A201-2017, as amended by the Owner.

.6 Scale/Schedule of Prevailing Wages (attached as Exhibit A to the AIA Document A201–2017, General Conditions of the Contract for Construction, as modified by the Owner for the project) and incorporated herein as if fully set forth.

.7 Any modifications to this Agreement or to the Contract or any Contract Documents approved by the Parties.

.8 Any documents stated in this Agreement as being a part of or incorporated into this Agreement or the Contract

.9 Exhibit C – Project Management Software

This Agreement entered into as of the day and year first written above.

« »	« »
OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
«Dr. Martha Salazar-Zamora » «Superintendent of Schools »	
(Printed name and title)	*(Printed name and title)*
(Date)	*(Date)*

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EXHIBIT A

Insurance and Bond Requirements
For Contractors on CSP projects

CONTRACTOR'S LIABILITY INSURANCE

The Contractor shall carry and maintain in force the insurance described below. Prior to execution of the Contract, the Contractor shall procure insurance coverage in the types and amounts as follows:

1. Workmen's Compensation	All liability arising out of Contractor's employment of workers and anyone for whom Contractor shall be liable for Worker's Compensation claims. Worker's Compensation is required and no "alternative" form of insurance shall be permitted. Waiver of Subrogation in favor of Owner and Program Manager required.
2. Employer's Liability	
a. Each Accident	$1,000,000.00
b. Disease (policy limit)	$1,000,000.00
c. Disease (each employee)	$1,000,000.00
3. Commercial General Liability	
a. Each Occurrence	$1,000,000.00
b. General Aggregate	$2,000,000.00 (A Designated Construction Project General Aggregate Limit shall be provided)
c. Personal & Advertising Injury	$1,000,000.00 (Each Person)
d. Products & Completed Operations	$1,000,000.00 (for one (1) year commencing with issuance of Final Certificate of Payment)
e. Bodily Injury and Property Damage (each, including Independent Contractors)	$1,000,000.00 each occurrence and $2,000,000.00 aggregate
f. Fire damage	$500,000.00
g. Medical expense	$5,000.00
4. Automobile Liability	
a. Bodily Injury/Property Damage	$1,000,000.00 (Combined single limit)
5. Umbrella or Excess Liability	
a. Each Occurrence and Aggregate	(a) One times Contract amount for all Contracts with the following minimum and maximum: (i) $1,000,000.00 minimum limit (ii) $25,000,000 maximum limit (b) The Umbrella shall provide coverage over the workmen's compensation, comprehensive general liability, and comprehensive automobile liability.
6. All Risk Builder's Risk	All Risk Builder's Risk against the perils of fire, lightening, wind storm, hurricane, hail, explosion, riot, civil commotion, smoke, aircraft, land vehicles, vandalism, malicious mischief, and all other perils in the amount one hundred percent (100%) of the value of the

	improvements including transit and materials stored off site. Additionally, this coverage shall provide protection to the full replacement value for boiler and machinery equipment up to installation, during testing, and until acceptance by Owner.

1. The required insurance must be written by a company licensed to do business in Texas at the time the policy is issued. In addition, the company must be acceptable to the Owner. The Owner's Representative will contact the State Board of Insurance to confirm that the issuing companies are admitted and authorized to issue such policies in the State of Texas.
2. The General Liability and Automobile so issued in the name of Contractor shall also name the Owner and Program Manager as additional insured. The coverage afforded to the additional insured under the policy or policies shall be primary insurance. It is the intent of the parties to this Agreement that the General Liability coverage required herein shall be primary to and shall seek no contribution from all insurance available to Owner, with Owner's insurance being excess, secondary and non-contributing. The Commercial General Liability coverage provided by Contractor shall be endorsed to provide such primary and non-contributing liability. If the additional insured has other insurance which is applicable to the loss, such other insurance shall be on an excess or contingent basis.
3. If the insurance is written with stipulated amounts deductible under the terms of the policy, the Contractor shall pay the difference attributable to deductions in any payment made by the insurance carrier on claims paid by this insurance to the extent Contractor the subject loss is due to the fault of Contractor, otherwise the deductibles may be included as a cost of the work only to the extent the deductibles are less than $25,000.00. If the Owner is damaged by the failure of the Contractor to maintain such insurance and to so notify the Owner then the Contractor shall bear all reasonable costs properly attributable thereto.
4. The insurance required by this Exhibit A shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment, and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents. Nothing contained herein shall limit or waive Contractor's legal or contractual responsibilities to Owner or others.
5. Contractor shall have its insurance carrier(s) furnish to Owner insurance certificates in form satisfactory to Owner specifying the types and amounts of coverage in effect, the expiration dates of each policy, and a statement that no insurance will be canceled or materially changed while the Work is in progress without thirty (30) calendar day's prior written notice to Owner. Contractor shall permit Owner to examine the insurance policies, or at Owner's option, Contractor shall furnish Owner with copies, certified by the carrier(s), of insurance policies required in Exhibit A. If Contractor neglects or refuses to provide any insurance required herein, or if any insurance is canceled, Owner may, but shall not be obligated to, procure such insurance.
6. Contractor and its Subcontractors shall not commence the shipment of equipment or materials or commence the Work at the site until all of the insurance coverage required of Contractor and its Subcontractors are in force and the necessary certificates and statements have been received by Owner and the Architect or Owner has issued a written notice to proceed.
7. As an alternative and at Owner's option and expense, Owner may elect to furnish or to arrange for

any part or all of the insurance required by Exhibit A hereof. If Owner so elects, it shall notify, in writing, Contractor and issue a Change Order therefor, but no adjustment to the scheduled completion date or the Contract Sum shall be allowed.

8. A copy of a certificate of insurance, a certificate of authority to self-insure issued by the Texas Workers' Compensation Commission, or a coverage agreement (DWC-81, DWC-82, DWC-83, or DWC-84), showing statutory Workers' Compensation insurance coverage for the person's or entity's employees providing services on a Project is required for the duration of the Project.
    a. 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.
    b. Persons providing services on the Project ("Subcontractor" in Texas Labor Code 406.096) include 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 contracted directly with the Contractor and regardless of whether that person has employees. This includes, without limitation, independent contractors, contractors, leasing companies, motor carriers, owner-operators, employees of any such entity, or employees of any entity that furnishes persons to provide services on the Project.
    c. Services include, without limitation, providing, hauling, or delivering equipment or materials, or providing labor, transportation, or other service related to a Project. Services do not include activities unrelated to the Project, such as food/beverage vendors, office supply deliveries, and delivery of portable toilets.
    d. 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.
    e. The Contractor must provide a certificate of coverage to the governmental entity prior to being awarded the contract.
    f. 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.
    g. The Contractor shall obtain from each person providing services on a Project, and provide to the governmental entity:
        i. A certificate of coverage, prior to that person beginning Work on the Project, so the governmental entity will have on file certificates of coverage showing coverage for all persons providing services on the Project; and
        ii. No later than seven (7) 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.
    h. The Contractor shall retain all required certificates of coverage for the duration of the Project and for one (1) year thereafter.
    i. The Contractor shall notify the governmental entity in writing by certified mail or personal delivery, within ten (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.
    j. The Contractor shall post on each Project site a notice, in the text, form, and manner

prescribed by the Texas Workers' Compensation Commission, 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 of coverage.

k. The Contractor shall contractually require each person with whom it contracts to provide services on a Project, to:
    i. 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 401.011(44) for all of its employees providing services on the Project for the duration of the Project;
    ii. Provide to 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;
    iii. Provide the Contractor, prior to the end of the coverage period, 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;
    iv. Obtain from each other person with whom it contracts, and provide 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;
        3. Retain all required certificates of coverage on file for the duration of the Project and for one (1) year thereafter;
        4. Notify the governmental entity in writing by certified mail or personal delivery, within ten (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
        5. Contractually require each person with whom it contracts to perform as required by items 1-4, with the certificates of coverage to be provided to the person for whom they are providing services.

l. 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 civil actions.

m. The Contractor's failure to comply with any of these provisions is a breach of contract by the Contractor that entitles the governmental entity to declare the contract void if the Contractor does not remedy the breach within ten (10) days after receipt of notice of breach from the governmental entity.

n. The coverage requirement recited above does not apply to sole proprietors, partners, and corporate officers who are excluded from coverage in an insurance policy or certificate of

authority to self-insure that is delivered, issued for delivery, or renewed on or after January 1, 1996. 28 TAC 110.110(i).

9. The Owner and Contractor shall waive all rights against (1) each other and the Contractors, Subcontractors, agents and employees each of the other, and (2) the Architect and separate Contractors, if any, and their contractors, Subcontractors, agents and employees, for damages caused by fire or other perils to the extent covered by property insurance applicable to the Work. The foregoing waiver afforded the Architect, his agents and employees shall not extend to the liability imposed by other portions of the Agreement. The Owner or the Contractor, as appropriate, shall require of the Architect, separate contractors, contractors and Subcontractors by appropriate agreements, written where legally required for validity, similar waivers, each in favor of all other parties enumerated in this Exhibit A.

PERFORMANCE BOND AND PAYMENT BOND

1. The Contractor is required, as a condition precedent to the execution of the Contract, to execute a PERFORMANCE BOND in the form required by TEXAS STATUTES, in an amount equal to ONE HUNDRED PERCENT (100%) of the Contract Sum.
2. The Contractor is required, as a condition precedent to the execution of the Contract, to execute a PAYMENT BOND in the form required by TEXAS STATUTES, in an amount equal to ONE HUNDRED PERCENT (100%) of the Contract Sum as security for payment of all persons performing labor and furnishing materials in connection with this Contract. (Bonding Company is to furnish such forms). All bonds shall name the Owner as additional Obligee.
3. The Payment and Performance Bond shall meet requirements of Chapter 2253 of the Texas Governmental Code. All bonds shall be issued by a surety company licensed, listed and authorized to issue bonds in the State of Texas by the Texas Department of Insurance. The surety company may be required by the Owner to have a rating of not less than "B" in the latest edition of Best's Insurance Reports, Property-Casualty. The surety company shall provide, if requested, information on bonding capacity, other projects under coverage and shall provide proof to establish adequate financial capacity for this Project.
    a. Should the bond amount be in excess of ten percent (10%) of the surety company's capital and surplus, the surety company issuing the bond shall certify that the surety company has acquired reinsurance, in a form and amount acceptable to the Owner, to reinsure the portion of the risk that exceeds ten percent (10%) of the surety company's capital and surplus with one or more reinsurers who are duly authorized and admitted to do business in Texas and that amount reinsured by an reinsurer does not exceed ten percent (10%) of the reinsurer's capital and surplus.
    b. The Sureties shall promptly file a signed copy of the Contract, Performance, and Payment Bonds with the Owner in full compliance with Chapter 2253 of the Texas Governmental Code or as required by the Agreement executed by the Parties.
4. All bonds will be reviewed by the Architect for compliance with the Contract Documents prior to execution of the contract. In the event that the Architect has any questions concerning the sufficiency of the bonds, the bonds will be referred to the Owner or the Owner's representative for review and decision.
5. All bonds shall be originals. The Contractor shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of the Power-of-Attorney. The name, address, and telephone number of a contact person for the bonding company shall be provided.

6. Upon the request in writing 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 permit a copy to be made.
7. Bonds shall be signed by an agent resident in the State of Texas and the date of the bond shall be the date of execution of the contract. If at any time during the continuance of the contract, the surety of the Contractor's bonds becomes insufficient, Owner shall have the right to require additional and sufficient sureties which the Contractor shall furnish to the satisfaction of the Owner within ten (10) business days after notice to do so. In default thereof, the Contractor may be suspended, and all payment or money due to the Contractor withheld.
8. By inclusion of this Section in the Contract Documents, the surety which issues the bonds is hereby notified that the Owner, the Architect, and their agents and employees do not represent and will not be responsible for the surety's interests during the course of the Work. To protect its interests, the surety shall have the right to attend pay estimate meetings, review Applications for Payment when requested in writing by them, comment upon and make recommendations regarding payments, and inspect the Work in the presence of the Contractor and the Architect. By providing the bonds for the Work, the surety shall and hereby waives any cause of action against the Owner, the Architect, their agents and employees, for any loss suffered by the surety by reason of overpayment of any amounts to the Contractor, unless such is a direct result of a fraudulent or grossly negligent act committed by such party.

EXHIBIT C

PROJECT MANAGEMENT SOFTWARE

I. PART 1 - G E N E R A L

A. DESCRIPTION

1. Owner requires the use of Project Management Software (Software) to track the progress of planning, design, and/or construction contracts. Software is an internet-accessed project tracking application featuring a centralized database of project information, assisting the Owner and Owner's Representative in managing project documents and communications. The joint use of Software is to facilitate electronic exchange of information, key processes, and overall management of the contract.

2. Software shall be the primary means of project information submission and management. To ensure searchability, access for all team members, uniformity, and date / time tracking all project documentation and correspondence shall be composed and / or generated within the Software by its built-in capabilities. The development of content by external tools or the import of content generated by external software is not permitted. Examples include, but are not limited to:

   a) Requests for Information (RFI).
   b) Revision documents (ASI, Clarification, Minor Change).
   c) Submittal Register.
   d) Field activity and observation reports (including daily reports)
   e) Rework Items List, etc.
   f) Meeting minutes for all meetings, including, but not limited to design meetings, utility coordination meetings, quality control meetings, progress meetings, pre-installation meetings, construction progress meetings, etc.
   g) Punchlist.
   h) Warranty requests and tracking log.

3. Documents requiring original signature will be input into Software, and signed originals (where required by the Agreement between the parties) are to be received by Owner's Representative on the same day the document is logged in electronically in Software.

4. When required by the Owner or Owner's Representative, or by the Agreement between the parties, paper documents shall also be provided (e.g., the signature of Contract Modifications and submission of Contract Claims). In the event of discrepancy between the electronic version and paper documents, paper documents shall govern.

5. Documents received that are not input into Software may not be accepted by the Owner and Owner's Representative. Unless stated otherwise in the Agreement between the parties, the fundamental operating concept for the Owner is that **if the documents do not exist in the Software, then they do not exist. The Software is the single source of truth for Project information and communication among the team**.

B. USER ACCESS LIMITATIONS

1. The Owner's Representative will control access to Software by allowing access and assigning user profiles to authorized users. User profiles will define levels of access into the system, determine assigned function-based authorizations (what can be seen), and determine assigned user privileges (what can be done).

2. The Owner will provide access to the Software upon notice that Contractor has activated a license with the Software company, thereby creating an authorized user. Sub-consultants, sub-contractors, and/or suppliers will not have direct access to Software unless those entities activate a license with the Software company. The Sub-consultants, sub-contractors, and/or suppliers may purchase seat licenses from the Software company. Entry of information exchanged and/or

transferred between authorized users and sub- consultants, sub-contractors, and/or suppliers on Software shall be the responsibility of the authorized users.

3. Owner will not reimburse for the cost of Software. Accounts can be purchased at no additional cost to the Owner by payment to the Software company. Each account will allow one (1) user to access the system per login. Other costs associated with the use of this system shall be evenly distributed in project overhead and spread across the duration of the contract (a separate cost line item shall not be allowed).

4. A minimum of one (1) half day training session on Software will be provided by the Owner to all authorized users as required. Training time shall be at a mutually agreed upon date and site.

5. Data entered in a collaborative mode (i.e., entered with the intent to share as determined by permissions and workflows within the Software system) by any and all authorized users shall be jointly owned.

C. AUTOMATED SYSTEM NOTIFICATION AND AUDIT LOGTRACKING

1. Review comments made (or lack thereof) by the Owner, Owner's Representative, Architect, and/or Engineer on submitted documentation shall not relieve parties from compliance with requirements of the Contract Documents.

2. All parties are responsible for managing, tracking, and documenting work to comply with the requirements of the Contract Documents. Owner or Owner Representative acceptance via automated system notifications or audit logs extends only to the face value of submitted documentation and does not constitute validation of submitted information.

D. COMPUTER REQUIREMENTS

1. Authorized users shall use computer hardware and software that meets the minimum requirements of the Software system as recommended by the manufacturer to access and utilize Software. As recommendations are modified authorized users shall upgrade their system(s) as required to meet the minimum recommendations. In the event that cloud-based systems are used, users shall ensure proper browser compatibility. Upgrading of a user's computer system(s) shall not be justification for a cost or time modification to theContract.

2. Authorized users shall ensure that connectivity to the Software system (whether at the home office or jobsite) is accomplished through high-speed access, as the time required to download information and input data becomes excessive and may cause the system to "time out".

E. USER RESPONSIBILITY

1. Authorized users shall be responsible for the validity of their information placed in Software and for the abilities of their personnel. Authorized users shall be knowledgeable in the use of computers, including Internet Explorer, e-mail programs such as Outlook, word processing programs such as Word, spreadsheet programs such as Excel, and Adobe Portable Document Format (PDF) document distribution programs.

2. Authorized users shall utilize existing forms in Software to the maximum extent possible. If a form does not exist in Software and users must include as an attachment or by uploading the data file, PDF documents will be created through electronic conversion rather than optically scanned.

F. USER ACCESS ADMINISTRATION

1. All parties shall provide the Owner's Representative with a list of key personnel for acceptance. List shall include authorized users of Software.

2. Notify the Owner's Representative immediately of any users that are to have access removed. Resubmit the personnel list whenever modified. User changes will take effect within one (1) working day of accepting the requested change.

3. The Owner reserves the right to perform a security check on all potential users.

G. CONNECTIVITY PROBLEMS

1. Software is a web-based environment and therefore subject to inherent speed and connectivity problems of the Internet. Authorized users provided access shall be responsible for their own connectivity to the Internet.
2. Software response time is dependent on the user's equipment, including processor speed, modem speed, Internet access speed, etc. and current traffic on the Internet. The Owner will not be liable for any delays associated from the usage of Software including, but not limited to slow response time, down time periods, connectivity problems, or loss of information.

II. PART 2 - P R O D U C T S

A. SOFTWARE COMPANY

1. Online Setup: Complete and submit firm information electronically via the following link: https://best-construction-software.projectmates.com/external-licensing
2. Password for Access: To access the webform, please use the following password:

a) Password: Projectmates2025!

3. License Creation: Once the licenses have been created, Projectmates Licensing will send you a confirmation email.
4. Important Information:

a) The cost for each user license is $795 annually. There is a $100 setup cost per user for the first year.

(1) Web-based training is required for new users. Cost for training is $600. Note: existing users may be allowed to waive Web-based training, subject to Owner and Software Company agreement.
(2) Example 1: If order is for 1 user, invoice will be $795 annual subscription (1 user license) plus $100 setup, plus $600 for 1 web-based training session for a total of $1,495.
(3) Example 2: If order is for 8 users, invoice will be for $6,360 annual subscription (8 users licenses @ $795 each) plus $100 setup, plus $600 for 1 web-based training session for a total of $7,060.

b) The user account(s) will be activated and invoice sent. Accounts will renew automatically each year. Let Projectmates Licensing know if you need to cancel the renewal invoice.
c) For TX, NJ, and WA companies: Sales tax will be added to the invoice. To avoid sales tax, please provide your sales tax exemption form with the order.

III. PART 3 - E X E C U T I O N

A. SOFTWARE UTILIZATION

1. Software shall be utilized in connection with submittal preparation and information management. Requirements of this section are in addition to requirements of all other contract requirements. Users will be provided a playbook for full application use instructions.

a) Design Document Submittals: Provide all concept drawings, review phase submissions, contract documents and specifications in PDF and native file format.

(1) Provide one (1) consolidated PDF file of all drawings;
(2) Provide one (1) consolidated PDF file of all specifications;
(3) Provide single PDF file for sheet by sheet drawings, and;
(4) Provide single PDF file for specification section by section

b) Shop Drawings: Shop drawing and design data documents shall be submitted as PDF attachments to the Software submittal workflow process and form. All PDF shop drawing submittal documents shall have the Contractor's review and submittal stamp

(including signatures) as specified in Specification Section “Submittal Procedures”, the same as if submitted as hard copy. Examples of shop drawings include, but are not limited to:

(1) Standard manufacturer installation drawings.
(2) Drawings prepared to illustrate portions of work designed or developed by the Contractor.
(3) Steel fabrication, piece, and erection drawings.
(4) Paving and grading plans
(5) Traffic safety and control plan

c) Product Data: Product catalog data and manufacturer’s instructions shall be submitted as PDF attachments to the Software submittal workflow process and form, except that color charts and similar color-oriented pages shall be submitted as hard copy separate from and in addition to the PDF copy. Submittal forms shall indicate when hard copy color documents are submitted. All PDF product data submittal documents shall have the Contractors review and submittal stamp (including signatures) as specified in Specification Section “Submittal Procedures”, the same as if submitted as hard copy. Examples of product data include, but are not limited to:

(1) Manufacturer’s printed literature.
(2) Preprinted product specification data and installation instructions.

d) Samples: Sample submittals shall be physically submitted as specified in Specification Section “Submittal Procedures”. Contractor shall enter submittal data information into Software with a copy of the transmittal form(s) attached to the submittal. Examples of samples include, but are not limited to:

(1) Product finishes and color selection samples.
(2) Product finishes and color verification samples.
(3) Finish/color boards.
(4) Physical samples of materials.

e) Administrative Submittals: All administrative submittals shall be recorded within the Software. Examples of administrative submittals include, but are not limited to:

(1) Master Schedule
(2) List of contact personnel.
(3) Plans for safety, demolition, environmental protection, and similar activities.

f) Administrative Processes: All administrative tasks shall be generated within and performed by the Software. The development of the following content Administrative Process by external tools is not permitted. Examples of administrative processes include, but are not limited to:

(1) Requests for Information (RFI).
(2) Revision documents (ASI, Clarification, Minor Change).
(3) Submittal Register.
(4) Field activity and observation reports (including daily reports)
(5) Rework Items List, etc.
(6) Meeting minutes for all meetings, including, but not limited to design meetings, utility coordination meetings, quality control meetings, progress meetings, pre-installation meetings, construction progress meetings, etc.
(7) Punchlist.
(8) Warranty requests and tracking log.

g) Cost and Contract Submittals:

(1) Contracts
(2) Invoices
(3) Applications for Payment
(4) Proposal Requests (PR, CPR, or RFP)
(5) Change Orders (CO)
(6) Allowance Expenditure Authorization (AEA)

h) Compliance Submittals: Test report, certificate, and manufacture field report submittals shall be submitted on Software as PDF attachments. Examples of compliance submittals include, but are not limited to:

(1) Field test reports.
(2) Quality Control certifications.
(3) Manufacturers' documentation and certifications for quality of products and materials provided.

i) Record and Closeout Submittals: In addition to actual delivery of hard copies of Closeout Submittals, Closeout Submittals shall be submitted on Software as PDF documents. The files shall be organized as follows, and follow consistent naming convention, for the benefit of the Owner's post-construction administration requirements. Examples of record submittals include, but are not limited to:

(1) Commissioning and T&B Report

(a) Commissioning Report
(b) Testing and Balancing Report

(2) Demonstration and Training
(3) Subcontractor List
(4) Attic Stock (Extra Materials, Spare Stock, etc.: Submittal forms shall indicate when actual materials are submitted)
(5) Certificates and AHJ Inspections

(a) Backflow Preventor
(b) Final Certificate of Completion
(c) Final Certificate of Occupancy
(d) Final Elevator Inspection
(e) Final Fire Inspection
(f) Substantial Certificate of Completion
(g) TDLR Inspection
(h) TEA Certificate of Project Compliance
(i) Temporary Certificate of Occupancy

(6) Consent of Surety
(7) O&M Manuals

(a) Keying Schedule
(b) O&M Manuals
(c) Shop Drawings

(8) Record Drawings and Specifications. Final documents shall be submitted as specified.

(a) Digital CAD BIM Native Files
(b) Project Manual
(c) Record Drawings

(9) Release of Lien
(10) Warranties
(11) Audit

2. Exceptions: Documents with legal consequences, contract modifications, contract claims,

security implications, and those required by other agencies may require an additional submittal as original hard copy with original signatures and seals. Hard copies of these documents shall be submitted as specified or as directed by the Owner's Representative. Requirement of both hard and electronic submittals shall not be justification for a cost or time modification to the Contract.

END OF SECTION

XXXV. EXHIBIT W - AIA DOCUMENT A201-2017

DRAFT

AIA® Document A201® – 2017

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)

«RFP-CSP #1003-26
New Tomball Intermediate School
11211 FM 2920
Tomball, TX 77375»

THE OWNER:
(Name, legal status and address)

«Tomball Independent School District »
«310 S. Cherry Street »
«Tomball, Texas 77375 »

THE ARCHITECT:
(Name, legal status and address)

«Huckabee Architects
1700 City Plaza Dr., Suite 125
Spring, TX 77389
»

THE PROGRAM MANAGER:
(Name, legal status and address)

«Lockwood, Andrews, & Newnam, Inc. »
«3700 West Sam Houston Parkway South, Suite 400 »
«Houston, Texas 77042 »

The Owner may retain Program Manager(s) to carry out some of the functions of the administration of the Owner's construction program. The Contractor, Architect, and Program Manager (when applicable) shall cooperate with each other in the performance of their respective functions. The management and reporting systems used by the Owner and/or Program Manager, including the assignment of the Program Manager, may be changed by Owner during the Project.

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2 OWNER

3 CONTRACTOR

4 ARCHITECT

5 SUBCONTRACTORS

6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

7 CHANGES IN THE WORK

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.

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.

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10 PROTECTION OF PERSONS AND PROPERTY

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12 UNCOVERING AND CORRECTION OF WORK

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14 TERMINATION OR SUSPENSION OF THE CONTRACT

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DRAFT

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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), 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 or the Owner. All sections of the Project Manual shall be a part of the Contract Documents. The solicitation documents used by the Owner, including advertisement or Requests for bids or Proposals, Instructions to Bidders, other information furnished by the Owner in anticipation of receiving bids or proposals, and Addenda relating to such solicitation documents, except to the extent that the proposal has been modified by the terms of the Contract shall be a part of the Contract Documents. Any reference to any Contract Documents shall mean the document as amended and/or supplemented for this Project.

§ 1.1.2 The Contract

The Contract Documents form the Contract for Construction (the "Contract") and are as fully a part of the Contract as if attached hereto 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. After execution of the original Contract Documents, 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.

§ 1.1.2.1 To be effective, all Contract Documents requiring signatures must be signed first by the Contractor and then by the Owner's authorized representative, after approval by Owner's Board of Trustees, unless otherwise delegated. If an approved Contract Document requiring signature has not been signed, then the missing signature shall be provided within a reasonable period of time. Failure to sign an approved Contract Document after notice and a reasonable opportunity to sign shall be considered a material breach of the Contract. Contractor's signing of the Agreement shall be considered as signing all Contract Documents identified therein.

§ 1.1.2.2 After execution of the original Contract Documents, the Contract may thereafter be amended or modified only by a written Modification signed by Contractor, approved by Owner's Board of Trustees, unless otherwise delegated, and signed by an authorized representative of Owner's Board of Trustees. As a material consideration for the making of the Contract, Modifications to the Contract shall not be construed against the maker of said Modifications.

§ 1.1.2.3 In the event of conflict, the order of precedence of the Contract Documents shall be as listed in the Agreement. Terms and conditions contained in the Agreement shall take precedence over terms and conditions contained in the General Conditions, and the terms and conditions in the General Conditions shall take precedence over all other terms and conditions contained in the other Contract Documents, except for Exhibit A, "Insurance and Bonds," attached to the Agreement, which shall take precedence over the General Conditions. An enumeration of the Contract Documents and their order of precedence, other than a Modification, appear in Article 9 of the AIA A101, as modified by the Owner for the Project

§ 1.1.2.4 Any reference to the Agreement, General Conditions, or any other Contract Document shall mean the document as amended and/or supplemented for this Project.

§ 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. The Work includes all of Contractor's responsibilities as to all labor, parts, supplies, skill, supervision, transportation services, storage requirements, and other facilities and things necessary, proper or incidental to the carrying out and completion of the terms of the Contract Documents and all other items of cost or value needed to

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produce, construct, and fully complete the public Work identified by the Contract Documents. The Contract Documents include all Construction Documents, such as Drawings and Specifications that establish in detail the quality levels of materials and systems required for the Project. The Construction Documents shall reflect all agreements between Owner and Architect concerning Owner's budgetary constraints, programmatic needs, and expectations as to quality, functionality of systems, maintenance costs, and usable life of equipment and facilities. Said Construction Documents shall reflect the Owner's educational program and educational specifications, the State educational adequacy, safety, and security standards in 19 TAC Section 61.1040, and any other standards to which the Architect is subject pursuant to applicable law or contract. The Architect shall provide Construction Documents which are sufficient for Owner to complete construction of the Project.

§ 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, wherever located and whenever issued, 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 or documents, including those in electronic form, prepared by the Architect and the Architect's consultants and shall set forth in detail the requirements for construction of the Project.

§ 1.1.8 Initial Decision Maker
The Initial Decision Maker is the person identified in the Agreement to render initial decisions or recommendations 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.

§ 1.1.9 Project Manual
The Project Manual is a volume assembled for the Work which includes the bidding or proposal requirements, sample forms, Conditions of the Contract and Specifications.

§ 1.1.10 Project Manual Addenda
Project Manual Addenda are written, or graphic instruments issued prior to the execution of the Contract, which modify or interpret the bidding or proposal documents, including Drawings and Specifications, by additions, deletions, clarifications, or corrections. Addenda will become part of the Contract Documents when the Agreement is executed. The Contractor and Subcontractors shall include all addenda items on their copies of the Drawings and Specifications.
§ 1.1.11 The terms "bids" or "bidding" shall include any kind of competitive purchasing/procurement under Texas Government Code Chapter 2269.

§ 1.1.12 Abbreviations

AIA:	American Institute of Architects
AIEE:	American Institute of Electrical Engineers
ACI:	American Concrete Institute
AHERA:	Asbestos Hazardous Emergency Response Act
AISI:	American Iron and Steel Institute
AISC:	American Institute of Steel Construction

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ANSI:	American National Standards Institute
ASA:	American Standards Association
ASTM:	American Society of Testing Materials
AWSC:	American Welding Society Code
CERCLA:	Comprehensive Environmental Response, Compensation, and Liability Act
EPA:	Environmental Protection Agency
FS:	Federal Specification
NEC:	National Electrical Code
NIC:	Not in Contract (indicates work not to be done by this Contractor under this Agreement)
OSHA:	Occupational Safety and Health Administration
SPR:	Simplified Practice Recommendation
TAS:	Texas Accessibility Standards
UL:	Underwriters Laboratories, Inc.

§ 1.1.13 Miscellaneous Other Words

§ 1.1.13.1 Calendar Days: The days of the Gregorian calendar. 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.

§ 1.1.13.2 Holidays: The days officially recognized by the construction industry in this area as a holiday; 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.

§ 1.1.13.3 Regular Work Days: All calendar days except holidays and Sundays. Requests for extensions of time shall be requested on the basis of Regular Work Days

§ 1.1.13.4 Anticipated Adverse Weather Days: An allowance of Regular Work Days established as probable days lost due to weather delays; said allowance to be included in the Contractor's Completion Time.

§ 1.1.13.5 Adverse Weather Days: Regular Work Days when rain, flooding, snow, unusually high winds, excessively wet grounds, or similar circumstances prevent progress on Critical Path portions of the Work. The Contractor will be entitled to an extension of the Contract Time for the net additional time, if any, which results from deducting the amount of Anticipated Adverse Weather Days from the total amount of approved Adverse Weather Days.

§ 1.1.13.5.1 Further, Adverse Weather is defined as the occurrence of one or more of the following conditions within a twenty-four (24) hour day that prevents construction activity exposed to weather conditions or access to the site:

1. Precipitation (rain, snow, or ice) in excess of twenty-five one hundredths of an inch (0.25") liquid measure, hereafter referred to as Standard Baseline.
2. Temperatures that do not rise above that required for the day's construction activity, if such temperature requirement is specified or accepted as standard industry practice.
3. Sustained wind in excess of twenty-five (25) m.p.h.
4. "dry-out" or "mud" days resulting from precipitation that occur beyond the standard baseline; only if there is a hindrance to site access or sitework and Contractor has taken all reasonable accommodations to avoid such hindrance; and, at a rate no greater than 1 make-up day for each day or consecutive days of precipitation beyond the Anticipated Adverse Weather Days that total 1.0 inch or more, liquid measure.
5. Adverse weather prevents work on the project for fifty percent (50%) or more of the Contractor's scheduled workday and critical path construction activities were included in the day's schedule, including a weekend day or holiday if Contractor has scheduled construction activity that day.

§ 1.1.13.6 Net Days: Actual Adverse Weather Days experienced to date less Anticipated Adverse Weather Days anticipated to date. Actual Instruction Days experienced to date less Anticipated Instruction Days anticipated to date.

§ 1.1.13.7 Instruction Days: Regular Workdays when the Owner operations prevent progress on Critical Path portions of the Work. The Contractor will be entitled to an extension of the Contract Time for the net additional time, if any,

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which results from deducting the amount of Anticipated Instruction Days from the total amount of approved Instruction Days.

§ 1.1.13.8 The term "business day" is a day the Owner's Administration Building is scheduled to be open for normal business purposes, unless closed by the Owner's Superintendent of Schools or designee for inclement weather or other reason. Days on which the Administration Building is normally closed are Thanksgiving Break, Winter Break, Spring Break, and Summer Break, as well as other federal, state or local days specified in the calendar approved by the Owner's Board of Trustees on an annual basis. A business day does not include a day on which the Owner's Administration Building is open only for the purposes of conducting candidate filing, early voting, elections, or other special events.

§ 1.1.13.9 The term "Direct Labor Cost" means the actual and verifiable salaries and wages (basic, premium and incentive) paid to personnel but does not include indirect payroll related costs or fringe benefits (Labor Cost Burden).

§ 1.1.13.10 The term "Labor Cost Burden" means the actual and verifiable cost of customary and statutory benefits including, but not limited to, social security contributions, unemployment, excise and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. Labor Cost Burden excludes all forms of general liability policy premiums and deductibles, safety training, tuition cost reimbursement, small tool expense, and union dues. The Owner reserves the right to request evidence of Labor Cost Burden at any time from Contractor and Subcontractors.

§ 1.1.14 The term "Compensable Change" means circumstances involving the performance of Extra Work:

1 that are the result of

(1) Differing Site Conditions,

(2) amendments or additions to Applicable Laws, which amendments or additions are enacted after the execution of the Agreement,

(3) a Change requested by Owner in accordance with the conditions of authorization applicable to Compensable Changes set forth in Article 7, below, or

(4) other circumstances involving a Change in the Work for which Contractor is given under the Contract Documents a specific and express right to a Change Order to the Contract Price;

2 that are not caused, in whole or in part, by an act or omission of Contractor or a Subcontractor, of any Tier, constituting negligence, willful misconduct, or violation of an Applicable Law, or by a failure of Contractor of a Subcontractor, of any Tier, to comply with the Contract Documents;

.3 for which a Change Order is neither prohibited by nor waived under the terms of the Contract Documents; and

.4 that if performed would require Contractor to incur additional and unforeseeable Allowable Costs that would not have been required to be incurred in the absence of such circumstances.

§ 1.1.15 The term "Compensable Delay" means a Delay to the critical path of activities affecting Contractor's ability to achieve Substantial Completion of the entirety of the Work within the Contract Time:

1 that is the result of

(a) a Compensable Change,

(b) the willful negligence of Owner, Architect, a Owner Consultant or a Separate Contractor,

(c) a breach by Owner of an obligation under the Contract Documents, or

(d) other circumstances involving Delay for which Contractor is given under the Contract Documents a specific and express right to a Change Order adjusting the Contract Price;

2 that is not caused, in whole or in part, by an act or omission of Contractor or a Subcontractor, of any Tier, constituting negligence, willful misconduct, or a violation of an Applicable Law, or a failure by Contractor or any Subcontractor, of any Tier, to comply with the Contract Documents; and

3 for which a Change Order to the Contract Time is neither prohibited by nor waived under the terms of the Contract Documents.

§ 1.1.16 The term "Excusable Delay" means a Delay, other than a Compensable Delay, to Contractor's ability to achieve Substantial Completion or Final Completion of the Work within the Contract Time that is: (1) not caused, in

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whole or in part, by an act or omission of Contractor or a Subcontractor, of any Tier, constituting negligence, willful misconduct, a violation of an Applicable Law or a failure by Contractor or any Subcontractor, of any Tier, to comply with the Contract Documents; (2) unforeseeable, unavoidable and beyond the control of Contractor and the Subcontractors, of every Tier; and (3) the result of a Force Majeure Event. Without limitation to the foregoing, neither the bankruptcy, insolvency nor financial inability of Contractor or a Subcontractor, of any Tier, nor any failure by a Subcontractor, of any Tier, to perform any obligation imposed by contract or Applicable Laws shall constitute a ground for Excusable Delay.

§ 1.1.17 The term "Unexcused Delay" means any Delay that is not a Compensable Delay or Excusable Delay or that constitutes a Compensable Delay or Excusable Delay for which Contractor is not entitled to a Change Order to the Contract Time, including, without limitation, the following: (1) Delay caused by an act or omission of Contractor or a Subcontractor, of any Tier, constituting negligence, willful misconduct, a violation of an Applicable Law or a failure by Contractor or any Subcontractor, of any Tier, to comply with the Contract Documents; (2) Delay for which Contractor has failed to provide a timely and complete Notice of Delay or Request for Extension; or (3) Delay associated with any circumstances where the costs or risk associated with such circumstances are designated in the Contract Documents as being at Contractor's risk or Contractor's Own Expense.

§ 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 During the course of the Work, should any conflict be found in or between the Contract Documents, the Contractor shall be deemed to have estimated the Work on the basis of the greater quantity or better quality, or the most stringent requirement, unless the Contractor obtained a decision in writing from the Architect as to what shall govern before the submission of the Contractor's proposal. The Architect, in case of such conflict, may interpret or construe the documents so as to obtain the most substantial and complete performance of the Work consistent with the Contract Documents and reasonably inferable therefrom, in the best interest of Owner, and the Architect's decision shall be final. The terms and conditions of this clause shall not relieve any party of any other obligation under the Contract Documents.

§ 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 Relation of Specifications and Drawings

General Requirements in the Specifications govern the execution of all Specifications. Summary paragraphs present a brief indication of the Work, but do not limit the Work as later detailed. The Drawings and Specifications are correlative and have equal authority and priority. 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. If Drawings and Specifications are not in concurrence regarding quantity or quality, Contractor shall request interpretation from the Architect. For purposes of construction, the Architect shall determine in writing 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.

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§ 1.2.4.1 Drawings are in part diagrammatic, and do not necessarily show complete details of construction, materials, or their performance, or installation, and do not necessarily show how construction details or other items of work or fixtures or equipment may affect any particular installation. These shall be ascertained by the Contractor from the Architect and correlated to bring the parts together to a complete whole.

§ 1.2.4.2 All dimensions shall be verified by field measurements and all work laid out to permit pipes, valves, ductwork, lights, panels, other items of construction, to be located as closely as possible to locations shown. All items shall be checked before installation to determine that they can be concealed properly, if appropriate, and that they clear any structural components, supports for other items, and cabinets and equipment or other mechanical, electrical or architectural items having fixed locations.

§ 1.2.4.3 Work shall be laid out to assure ready accessibility to valves, fittings, and other items requiring servicing, adjustment or checking.

§ 1.2.4.4 Actual physical dimensions of specified stock items shall govern over dimensions shown for work to receive stock items. Custom items or modified stock items shall be fabricated to dimensions shown, or to fit into other dimensioned work.

§ 1.2.4.5 If Work is required in a manner which makes it impossible to produce the specified quality of Work, or should errors, omissions, or discrepancies exist in the Contract Documents, the Contractor shall request in writing an interpretation before proceeding with Work. If Contractor fails to make such a written request, no excuse or claim will thereafter be entertained for failure to carry out Work in a satisfactory manner as specified by Contract Documents. Should conflict occur in or between Drawings and Specifications which should reasonably have been ascertained by the Contractor, Contractor is deemed to have estimated and included in the Contract Sum the more expensive way of doing the Work.

§ 1.2.5 Materials, Equipment and Processes

The mechanical, electrical, and plumbing drawings show the general arrangement and extent of the Work. Exact location and arrangement of the various parts shall be determined with the approval of the Architect after equipment has been selected and as the Work progresses.

§ 1.2.5.1 All Work shall, insofar as possible, be installed in such a manner as will not interfere with architectural or structural portions of the building. Should changes become necessary because of a failure of the Contractor to comply with the bidding instructions concerning equipment requiring area not shown on the Construction Documents, the Contractor shall be fully responsible for completing any required modifications or eliminating any interferences. The Contractor shall be required to submit material data and drawings on all equipment, which may vary from the Drawings and Project Manual, and any interferences must be eliminated before Work proceeds.

§ 1.2.5.2 Where in the Project Manual, Specifications, and Drawings, certain products, manufacturer's trade names, or catalog numbers are given, it is done for the express purpose of establishing a standard of function, dimension, appearance, and quality of design, in harmony with the Work, and is not intended for the purpose of limiting competition. Where particular items are specified, products of those named manufacturers are required unless Contractor submits for consideration proposed substitutions of materials, equipment or processes from those set out in the Contract Documents. Submittals of proposed substitutions should contain sufficient information to allow the Architect and Owner to determine if the proposed substitution is in fact equal to or better than the requirements in the Contract Documents. Contractor shall bear all risk caused by submitting substitutions, including all costs. The Owner may approve substitutions only when the substitution is clearly provided by the Contract to be equal in performance characteristics to the requirements of the Contract Documents, equally compatible with the existing installations, and complementary to the architectural design for the Work. Certain specified construction and equipment details may not be regularly included as part of the named manufacturer's standard catalog equipment but shall be obtained by the Contractor from the manufacturer as required for the proper evaluation and/or functioning of the equipment. Reasonable minor variations in equipment are expected and will be acceptable, if approved in advance by the Architect and Owner; however, indicated and specified performance and material requirements are the minimum. The Owner and the Architect reserve the right to determine the equality of equipment and materials that deviate from any of the indicated and specified requirements. Materials or equipment shall not be substituted unless the Architect has specifically accepted such substitution for use on this Project in writing.

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§ 1.2.5.3 Diagrammatic indications of piping, ducts, conduit, and other similar items are subject to adjustment to obtain required grading, passage over, under or around obstructions, to avoid exposure to finished areas, or unsightly, obstructing conditions. Contractor shall be responsible for coordination of these adjustments and recommending alternate solutions whenever design details affect construction feasibility, costs, or schedules. All manufactured articles, materials, and equipment shall be incorporated into the Work in accordance with the manufacturer's written or printed directions and instructions unless otherwise indicated in the Contract Documents.

§ 1.2.6 Standards and Requirements

When the Work is governed by reference to standards, building codes, manufacturers' instructions, or other documents, unless otherwise specified, the current edition as of the date of execution of the Agreement shall apply. Requirements of public authorities apply as minimum requirements only and do not supersede more stringent specified requirements.

§ 1.2.7 Errors in Construction Documents

The Owner and Contractor agree that the Contract Documents may not be free from errors, inconsistencies, or omissions. The Contractor stipulates and agrees that the Owner has no duty to discover any errors, inconsistencies, or omissions in the Drawings, Plans, Specifications and other Construction Documents, and has no duty to notify Contractor of same. Owner makes no warranty as to the completeness, adequacy, and accuracy of any Drawings, Plans, Specifications or other Construction Documents, either express or implied. Execution of the Contract by the Contractor is a representation that the Contractor has thoroughly reviewed and become familiar with the Contract Documents and that the Contractor is not aware of any errors, inconsistencies, or omissions in the Contract Documents which would delay the Contractor in the performance of the Contract Work. The Contractor shall not be entitled to any damages or increase in the Contract Sum due to delays or disruptions to the Work.

§ 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 All ownership rights, whether common law, statutory, or other reserved rights, including copyright ownership, of the Instruments of Service/Construction Documents, are controlled by the Agreement between the Owner and the Architect. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service or Construction Documents. The Owner holds perpetual right to use all of the Instruments of Service / Construction Documents for this Project. 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 any 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 copyright holder. All copies of the Instruments of Service and Construction Documents, except the Contractor's record set, shall be returned or suitably accounted for to the copyright holder upon completion of the Work.

§ 1.6 Notice

§ 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 shall be deemed to have been duly served if delivered to the individual for which it was intended in person, by registered or certified mail, return receipt requested, by courier service providing proof of delivery, or by electronic transmission (facsimile or email), with electronic confirmation of receipt, if a method

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for electronic transmission is set forth in the Agreement. For notices delivered by electronic transmission and received after 5:00 p.m. on a day on which the recipient's offices are open, or on a weekend, Holiday, or other day on which the recipient's offices are closed, notice shall be deemed to have been duly served on the next day on which the recipient's offices are open.

§ 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, return receipt requested, or by courier providing proof of delivery.

§ 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, including, in the Owner's sole discretion, using 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. Notwithstanding any provision herein to the contrary, if the parties agree to an exchange of electronic data/CAD files, such transfer shall be in accordance with the following requirements: the seals and signatures shall be removed from any Drawings or Project Manual and the following statement substituted: The record copy of this Drawing or Project Manual is on file at the Architect's office. This electronic document is released for the purposes of reference, coordination and/or facility management under the authority of Texas Registration Number Architect License No. (insert License #). Any modification of this Drawing or Project Manual shall be in compliance with the Texas Board of Architectural Examiner's rules.

§ 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 Section 1.7, above, or any use of Contract Documents or any other information or documentation in digital form inconsistent with those protocols set forth in Section 1.7, above, 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.

§ 1.9 Parties to Consult

§ 1.9.1 Representatives of the Owner, Contractor, and Architect shall meet periodically at mutually agreed upon intervals for the purpose of establishing procedures to facilitate cooperation, communication and timely responses among the participants. By participating in this arrangement, the parties do not intend to create additional contractual obligations or modify the legal relationships which may otherwise exist.

§ 1.9.2 Contractor acknowledges that the Contract Sum reflects Owner's absolute budgetary limit for the Costs of the Work. Should the Contractor become aware of circumstances with respect to the Work that, if not addressed or remedied would lead to a cost overrun, it shall immediately notify Owner and Architect of the existence of such circumstances and its recommendation for addressing the circumstances, including any possible elimination or offset of the cost overrun. If at any time circumstances arise that might result in the Contract Sum being exceeded, the Owner, Contractor and Architect shall consult and revise the Drawings and Project Manual (including, but not limited to consideration of substitutions of materials) in such fashion as to cause the Work as revised to be accomplished for the Contract Sum; provided that no such revision shall result in a material diminishment of the square footage of the instructional facilities.

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 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, including, but not limited to, a Change Order or Construction Change Directive modifying the Contract Sum or an extension to the date of Substantial or Final Completion. The Board of Trustees may designate in writing one or more persons to represent the Owner and act on its behalf for such matters, as well as day-to-day operations under the Contract, in accordance with the current policy of the Board of Trustees; however, such representatives shall have the authority to bind the Owner only to the extent expressly authorized by the Owner and shall have no implied authority. Neither Architect nor Contractor may rely upon the direction of an employee of Owner who has not been designated as set forth herein, and Owner shall not be responsible, financially or otherwise, for actions taken by the Architect or Contractor in reliance upon direction from unauthorized persons.

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Except as otherwise provided in Section 4.2.1, the Architect does not have the authority to bind the Owner with respect to matters requiring Owner's approval or authorization. The Owner has contracted with the Architect who will carry out the functions of administration of the Project and the initial arbiter of Claims as identified in Section 15.2.

§ 2.1.2 The presence of the Owner, the Owner's representative(s) or Architect at the Work site does not imply acceptance or approval of the Work.

§ 2.1.3 The Owner may require that the Contractor use and/or respond to certain Owner-furnished forms or inquiries during the course of the Project. From time to time, there may be future revisions, changes, additions or deletions to these forms. The fact that the Owner modifies and increases reasonable reporting requirements shall not serve as the basis for a claim for additional time or compensation by the Contractor.

§ 2.2 Intentionally 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. Contractor shall pay for all permit fees and inspection fees required for performance of the Work other than inspection and testing fees which the Owner contracts for separately with a third party, and Certificates of Occupancy fees. All of such fees shall be considered Cost of the Work unless the Contractor is required to pay for them without reimbursement due to the Contractor's fault under other provisions of the Contract Documents.

§ 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 whose status under the Contract Documents shall be that of the Architect. Owner shall notify Contractor if a new Architect has been employed by Owner.

§ 2.3.4 If requested in writing to do so by the Contractor prior to the start of the Work, the Owner may, at the Owner's sole discretion, furnish surveys known to the Owner describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. Owner does not guarantee the accuracy of surveys provided, including the locations of utility lines, cables, pipes, or pipelines, or the presence or absence of easements. The Contractor shall not be entitled to rely on the accuracy of information furnished by the Owner and shall exercise proper diligence and take appropriate precautions relating to the safe performance of the Work. THE OWNER DOES NOT IN ANY WAY REPRESENT, WARRANT OR GUARANTY TO CONTRACTOR OR TO ANY OTHER PERSON THE RELIABILITY, CONSTRUCTABILITY, COMPLETENESS, OR ACCURACY OF ANY SURVEYS, REPORTS, STUDIES, TESTS, ARCHITECTURAL OR ENGINEERING PLANS, OR SIMILAR INFORMATION PROVIDED BY OWNER IN CONNECTION WITH THIS CONTRACT, NOR DOES THE OWNER REPRESENT, WARRANT OR GUARANTY THAT SUCH INFORMATION IS FREE FROM DEFECTS, ERRORS OR DEFICIENCIES, AND ALL SUCH REPRESENTATIONS, WARRANTIES AND GUARANTIES ARE HEREBY EXPRESSLY DENIED AND DISCLAIMED. The Owner shall not be liable to the Contractor or any other person for breach of warranty or misrepresentation in the event of any errors or deficiencies in such information provided to the Contractor by the

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Owner. The Owner's provision of a survey will not relieve the Contractor from its obligations to examine the site or exercise proper precautions relating to the safe performance of the Work.

§ 2.3.5 Information or services required of the Owner by the Contract Documents shall be furnished by the Owner within a reasonable time following actual receipt of a written request. Absent such timely request by Contractor, any Claim based upon lack of such information or services shall be waived. The Owner shall not be required to expend any funds to obtain such information unless Owner agrees to do so.

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one .pdf copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2. The cost of reproductions will be borne by the Contractor.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct non-conforming or defective Work as required by Section 12.2, or fails to complete the Work on time as required by the Contract or is in default of any of its material obligations hereunder, the Owner, by a written order signed by an agent specifically so empowered by the Owner, may order 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 any duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity. This right shall be in addition to, and not in restriction of, the Owner's rights under Section 12.2.

§ 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 within a three-day period after receipt of 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 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 Owner or 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 actual cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's and other consultants' additional services and expenses made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner within thirty (30) days after receipt of written notice from the Owner therefor. 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.

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. If the Work is performed under a Construction Manager at Risk delivery method, the term "Contractor" shall include the Construction Manager or its authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents and in a good and workmanlike manner except to the extent the Contract Documents expressly specify a higher degree of finish or workmanship. Workmanship shall be of a quality to produce first class results. This shall mean that all material shall be installed in a true and straight alignment, level and plumb, patterns shall be uniform, and jointing of materials shall be flush and level unless otherwise directed in writing by the Architect. All labor shall be performed in the best manner by laborers, workers, and mechanics skilled in their respective trades.

§ 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 in the Architect's administration of the Contract, activities of the Owner (or Owner's Program Manager, if applicable), or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

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§ 3.1.4 By submission of a proposal, the Contractor represents and warrants the following to the Owner (in addition to the other representations and warranties contained in the Contract Documents), as an inducement to the Owner to execute this Contract, which representations and warranties shall survive the execution and delivery of the Contract and the Final Completion of the Work: (1) that the Contractor is financially solvent, able to pay its debts as they mature, and possessed of sufficient working capital to complete the Work and perform its obligations under the Contract Documents; (2) that the Contractor is able to furnish the plant, tools, materials, supplies, equipment, and labor required to timely complete the Work and perform its obligations hereunder and that the Contractor is sufficiently experienced and competent to do so; (3) that the Contractor is authorized to do business in the State where the Project is located and properly licensed by all necessary governmental, public, and quasi- public authorities having jurisdiction over the Contractor, the Work, or the site of the Project; and (4) that the execution of the Contract and its performance thereof are within the Contractor's duly-authorized powers.

§ 3.1.5 Pursuant to Texas Education Code Section 44.034, Contractor must give advance written notice to the Owner if the Contractor or an owner or operator of the Contractor has been convicted of a felony. The Owner may terminate the Contract if the Owner determines that the Contractor failed to give such notice or misrepresented the conduct resulting in the conviction. This paragraph requiring advance notice does not apply to a publicly-held corporation.

§ 3.1.6 Contractor, its Subcontractors, Sub-subcontractors, suppliers, and other vendors shall bear responsibility for compliance with all applicable state and federal laws, regulations, guidelines, and ordinances applicable to the Work, including but not limited to, laws concerned with labor, equal employment opportunity, safety, minimum wages, and prevailing wage rates. Contractor further recognizes that the Owner and Architect do not owe the Contractor or any Subcontractor, Sub-subcontractor, supplier, or other vendor any duty to supervise or direct its work so as to protect such party from the consequences of its own conduct. Without limiting the foregoing, the Owner reserves the right to utilize one or more of its employees to function in the capacity of the Owner's inspector, whose primary function will be daily inspections, checking pay requests, construction timelines, and storage of supplies and materials.

§ 3.1.7 The Contractor shall disclose the existence and extent of any financial interests, whether direct or indirect, such Contractor may have in any Subcontractor, Sub-subcontractor, supplier, and other vendor which the Contractor may propose for the Project.

§ 3.1.8 It is understood and agreed that the relationship of Contractor to Owner shall be that of an independent contractor. Nothing contained the Contract or inferable therefrom shall be deemed or construed to: (1) make Contractor the agent, servant or employee of the Owner; or (2) create any partnership, joint venture, or other association between Owner and Contractor. Any direction or instruction by Owner in respect of 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 as described herein.

§ 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. Contractor also represents by its execution of the Contract, that the Contractor has thoroughly reviewed all of the Contract Documents and that based on such review and to the best knowledge of Contractor as a contractor, not as a design professional, that said Contract Documents are sufficient to enable the Contractor to determine the Contract Sum and that the Contract Documents are sufficient to enable it to perform the Work described in the Contract Documents, and otherwise to fulfill all its obligations hereunder in accordance with the terms of the Contract. The Contractor further acknowledges and declares that it has visited and examined the site (but only as to visible surface conditions or conditions ascertainable from the results of any subsurface tests required or provided in connection with this Project, or other reports and documents available to the Contractor) and reasonably examined the physical, legal and other conditions affecting the Work including, without limitation, all soil, subsurface, water, survey and engineering reports and studies delivered to or obtained by Contractor and the conditions described in this Section 3.2.1. In connection therewith, Contractor, by execution of the Contract will be representing and warranting to Owner that it has, by careful examination, satisfied itself as to the conditions and limitations under which the Work is to be performed, including, without limitation, (1) the location, layout and nature of the Project site and surrounding areas, (2) generally prevailing climatic and weather conditions, (3) anticipated labor supply and costs, (4) availability and cost of materials, tools and equipment

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and (5) other similar issues. In arriving at the Contract Sum, the Contractor has, as an experienced and prudent manager and contractor, exercised its reasonable judgment and expertise to include the impact of such circumstances upon the Contract Sum.

.1 Claims for additional compensation or time because of the failure of the Contractor to familiarize itself with visible surface conditions at the site or other conditions under which the Work is to be performed will not be allowed.

.2 The Owner assumes no responsibility or liability for the physical condition or safety of the Project site or any improvements located on the Project Site. The Contractor shall be solely responsible for providing a safe place for the performance of the Work. The Owner shall not be required to make any adjustment in the Contract Sum, Guaranteed Maximum Price, if applicable, or Contract Time in connection with any failure by the Contractor or any Subcontractor to comply with the requirements of this Section 3.2.

.3 The Contractor represents that the Subcontractors, manufacturers and suppliers engaged or to be engaged by it are and will be familiar with the requirements for performance by them of their obligations. All contracts with subcontractors and suppliers shall be in writing. and shall reflect the terms of this Contract which directly or indirectly affect subcontractors or suppliers, including Owner's right to withhold payment, retainage requirements, and Owner's rights and liability on termination of this Contract. The Contractor shall require compliance with the terms and provisions of the Contract Documents applicable to them, including, without limitation, the requirement for subcontractors to comply with the prevailing wage rates established in the Contract, to maintain worker's compensation coverage on employees, and to provide certification of such coverage to Contractor.

§ 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 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. In addition, as part of the Contractor's preconstruction services, in reviewing the Contract Documents, the Contractor shall endeavor to detect any errors, omissions, or inconsistencies in the design and other documents which affect the performance or constructability of the Work. The Contractor shall promptly report to the Architect and the Owner 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. 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. If, in the opinion of the Architect or the Owner, the Contractor does not make a reasonable effort to comply with the above requirements or such information was available to the Contractor from a careful study and comparison of the Contract Documents, field conditions, Owner-provided information, Contractor-prepared coordination drawings, or prior Project correspondence or documentation, and this causes the Architect or its Consultants to expend additional time in the discharge of the duties imposed by the Contract Documents, then the Contractor shall bear the cost of compensation for the Architect's and its consultants' additional services and expenses made necessary by the Contractor's failure and the Owner shall be entitled to deduct such amounts from the Contract Sum. The Architect will give the Contractor prior notice of intent to bill for additional services and expenses before additional services are performed or additional expenses are incurred.

.1 The exactness of grades, elevations, dimensions, or locations given on any Drawings issued by the Architect, or the work installed by other contractors, is not guaranteed by the Owner. The Contractor shall, therefore, satisfy itself as to the accuracy of all grades, elevations, dimensions, and locations. In all cases of interconnection of its Work with existing or other work, it shall verify at the site all dimensions relating to such existing or other work. Any errors due to the Contractor's failure to so verify all such grades, elevations, dimensions, or locations shall be promptly rectified by the Contractor without any additional cost to the Owner.

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§ 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 and the Owner any nonconformity in the Contract Documents with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities that is discovered by or made known to the Contractor as a request for information in such form as the Architect or Owner may require. The Owner 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.

§ 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 notify the Owner prior to incurring such additional cost or expending such additional time, or if Contractor cannot reasonably provide notice prior to incurring costs or expending additional time, then as soon thereafter as reasonably possible, but not later than 10 Calendar Days, and may 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 including any extra efforts as required to bring the project back into alignment with the original schedule. 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 and limitations of the Contractor's ability to satisfactorily perform the Work or to honor an applicable warranty, and limitations of or interference with the Owner's intended use, caused by products or systems specified except when: (1) such errors, inconsistencies, omissions, differences, nonconformities, or limitations are the fault of Contractor, in whole or in part, (2) the Contractor failed to discover such errors, inconsistencies, omissions, differences, or nonconformities due to its failure to properly perform the obligations of Section 3.2.2 or 3.2.3, (3) the Contractor recognized such errors, inconsistencies, omissions, differences, nonconformities, or limitations and failed to report them to the Architect and the Owner, or (4) the Contractor should have detected such errors, inconsistencies, omissions, differences, nonconformities, or limitations as part of Contractor's performance of its obligations under the Contract Documents, including the performance of Contractor's preconstruction services.

§ 3.2.5 Notwithstanding the delivery of a survey or other documents by the Owner, prior to performing any Work, Contractor shall, if applicable, independently determine the location of 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 the Work in such a manner so as to avoid damaging any such lines, cables, pipes, and pipelines. Contractor shall be responsible for any damage done to such utility lines, cables, pipes and pipelines during its Work, and shall be responsible for any loss, damage, or extra expense resulting from such damage. Repairs shall be made immediately to restore all service. Any delay for such break shall be attributable to Contractor. In addition, Contractor shall, if applicable, review the appropriate AHERA and hazardous materials surveys for the particular site(s) involved in the Project, and shall notify all Subcontractors and Sub-subcontractors of the necessity to review said surveys. Contractor shall perform the Work in such a manner as to avoid damaging, exposing, or dislodging any asbestos-containing materials that are clearly identified and located in AHERA and other hazardous material surveys. Before performing any portion of the Work, the Contractor shall fully investigate all physical aspects of the Project site and verify all dimensions, measurements, property lines, grades and elevations, existing improvements, and general suitability of existing conditions at the Project site. If applicable, Contractor shall comply with U.S. Environmental Protection Agency rules concerning renovating, repairing or painting work in schools built prior to 1978 involving lead-based paint.

§ 3.2.6 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 an applicable warranty, or will result in a limitation of or interference with the Owner's intended use, then the Contractor shall promptly notify the Architect and Owner in writing, providing substantiation for its position.

§ 3.2.7 The Contractor shall arrange meetings prior to commencement of the Work of all major Subcontractors to allow the Subcontractors to demonstrate an understanding of the Contract Documents to the Architect and to allow the Subcontractors to ask for interpretations, when necessary. The Contractor and each Subcontractor shall evaluate

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and satisfy themselves as to the conditions and limitations under which the Work is to be performed, including: (1) The location, condition, layout, drainage 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.

§ 3.3 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 that 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 propose alternative means, methods, techniques, sequences, or procedures. Contractor shall not proceed with that portion of the Work without further written instructions from the Architect. If the Contractor is then instructed to proceed without acceptance of changes proposed by the Contractor, the Contractor shall not be responsible for any resulting loss or damage to the extent that the acceptance of Contractor's proposed alternative means, methods, techniques, sequences, or procedures would have avoided such loss or damage.

§ 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.

§ 3.3.2.1 Contractor shall, before any duties are performed on Owner's property where students are present (and with respect to additional employees/applicants hired or assigned to perform services on Owner's property during the term of the Contract with Owner, before or immediately after employing or securing the services of such additional employee/applicant), and at least annually thereafter, comply with all requirements relating to criminal history information required by Texas Education Code Chapter 22, unless Owner, in its sole discretion, determines in writing that an exception applies under Section 22.0834(a-1) of the Texas Education Code regarding certain employees/applicants of public works contractors, subject to Contractor's and all Subcontractors' compliance with Section 22.0834 of the Texas Education Code. Before beginning any Work on the Project, Contractor will provide written certifications and fitness determinations and all information requested by Owner to the Owner (including, without limitation, all covered employees' written consent to the release of their criminal history record information to Owner, so that the Owner may obtain criminal history record information on such individuals). In addition, Contractor shall certify to Owner that Contractor has complied with all applicable statutory requirements as of that date. 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 Owner. Upon request by Owner, Contractor will provide, in writing, updated certifications and fitness determinations and the names and any other requested information regarding individuals to whom Chapter 22 applies (including, without limitation, such individuals' written consent to the release of their criminal history record information to Owner), so that the Owner may obtain criminal history record information on such individuals. Contractor shall be solely responsible to send or ensure that each covered employee sends to the Texas Department of Public Safety (DPS) all information that may be required by DPS for obtaining national criminal history record information, which may include, but is not limited to, a complete set of the person's fingerprints and a recent electronic digital image photograph of the person. Contractor shall assume all expenses associated with obtaining criminal history record information. It shall be the responsibility of the Contractor and the entities with which the Contractor contracts to ensure compliance with this provision.

§ 3.3.2.1.1 Subcontractors or any Subcontracting entity, as defined by Texas Education Code Chapter 22, shall be required by the terms of their contract with Contractor or any other contracting entity (as defined in Texas Education Code Chapter 22), and by Texas law, to comply with all requirements relating to criminal history record information on their employees, agents, or applicants, to give required certifications and fitness determinations and provide all information requested by Owner to Owner and the contracting entities (including, without limitation, such individuals' written consent to the release of their criminal history record information to Owner, so that the Owner may obtain criminal history record information on such individuals), and to obtain required certifications/fitness determinations/compliance from the subcontracting entity's subcontractors. Subcontractors shall be solely responsible to send or ensure that each covered employee sends to DPS all information that may be required by DPS

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for obtaining national criminal history record information, which may include, but is not limited to, a complete set of the person's fingerprints and a recent electronic digital image photograph of the person.

§ 3.3.2.1.2 Contractor/Subcontractor will not assign any "covered employees" with a "disqualifying criminal history," as those terms are defined below, to work on the Project. If Contractor/Subcontractor at any time receives information that a covered employee has a reported disqualifying criminal history, then Contractor/Subcontractor will immediately remove the covered employee from the Project and notify the Owner in writing within three (3) business days. If Owner at any time, in its sole discretion, objects to the assignment of a covered employee for any reason, including, but not limited to, on the basis of the covered employee's criminal history record information and/or insufficient qualifications, lack of experience, and the like, based on information gathered by Owner through the procurement and/or contracting processes, Contractor/Subcontractor agrees to discontinue using that covered employee to provide services on Owner's Project. If Contractor/Subcontractor has (1) taken precautions or imposed conditions to ensure that the employees of Contractor or any Subcontractor will not become covered employees, or (2) certified to Owner conditions or precautions resulting in the determination that the criminal history record information requirements do not apply to its employees or applicants for employment (pursuant to the exception for certain employees/applicants of public works contractors under Texas Education Code Section 22.0834(a-1)), Contractor/Subcontractor shall ensure that the precautions or conditions continue to exist throughout the time that the contracted services are provided.

§ 3.3.2.1.3 For the purposes of this Section 3.3.2.1, "covered employees" means employees, agents or Subcontractors of Contractor or a Subcontractor who have or will have continuing duties related to the service to be performed on Owner's Project and have or will have direct contact with Owner's students. "Disqualifying criminal history" means: (1) a conviction or other criminal history information designated by Owner; or (2) a felony or misdemeanor offense that would prevent a person from being employed under Texas Education Code § 22.085(a), that is: (a) conviction of a felony offense under Title 5, Texas Penal Code if at the time of the offense, the victim was under 18; (b) conviction of or placement on deferred adjudication community supervision for an offense for which a defendant is required to register as a sex offender under Chapter 62, Texas Code of Criminal Procedure; or (c) conviction of an offense under federal law or the laws of another state that is equivalent to (a) or (b). Owner shall be solely responsible for making the final determination of what constitutes direct contact with Owner's students and what constitutes a disqualifying criminal history.

§ 3.3.2.2 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 Contractor's 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 or possessing weapons, speaking profane and/or offensive language, or engaging in any inappropriate interactions of any nature whatsoever with Owner's students or employees, including talking, touching, staring or otherwise contributing to a hostile or offensive environment for Owner's students or employees. 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 or the general public. Sexual harassment is strictly forbidden. Any employee of the Contractor or a Subcontractor who is found to have engaged in any such conduct shall be subject to appropriate disciplinary action by the Contractor or Subcontractor, including immediate removal from the job site.

§ 3.3.2.3 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, including wearing shirts at all times, and "badging" of Contractor's employees, Subcontractors, and all other persons carrying out the Work on the job site for identification. Contractor shall ensure that all construction workers, whether Contractor's own forces or the forces of Contractor's Subcontractors, wear identification tags on the front of their persons during all times that they are on Owner's property. Such identification tags shall contain a current photograph and the worker's name in a typeface large enough to be seen from a reasonable distance. Contractor shall furnish to Owner (and update, as appropriate) photo identification of all workers and employees.

§ 3.3.2.4 Contractor shall require all construction workers, whether Contractor's own forces or the forces of Contractor's Subcontractors, to park their personal motor vehicles on Owner's property only in the parking places

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designated by the Owner's campus principal or other facility administrator. Any vehicles not parked in the appropriate locations shall be towed at the vehicle owner's sole expense.

§ 3.3.2.5 Contractor shall follow, and shall require all employees, agents and subcontractors to follow, the tree ordinance of the municipality in which the Project is located. In addition, if not covered by the municipal tree ordinance, Contractor shall barricade and protect all trees on the Project, which shall be included in the Cost of the Work.

§ 3.3.2.6 Contractor shall institute a theft deterrence program designed to restrict construction worker access to properties of Owner that are currently in use, to maintain supervision of Contractor's and Contractor's Subcontractor's forces, and to reimburse the Owner or those persons suffering a theft loss which results from Contractor's forces or Contractor's Subcontractor's forces' actions, omissions, or failure to secure the Work or connecting or adjacent property. All such programs shall be paid as General Conditions.

§ 3.3.2.7 Any individual found by Owner to have violated the standards of conduct or restrictions set forth in Section 3.3.2 is subject to immediate removal from the job site and, in Owner's sole discretion, permanent removal from the Project or all construction on any of Owner's property. Repeated removal of Contractor's or Contractor's Subcontractor's forces, or one serious infraction, shall constitute a material breach of the Contract justifying the immediate termination by Owner pursuant to Article 14. THE CONTRACTOR HEREBY RELEASES, INDEMNIFIES AND HOLDS HARMLESS THE OWNER FROM AND AGAINST CONTRACTOR'S AND ANY SUBCONTRACTOR'S FORCES' NON-COMPLIANCE WITH THE STANDARDS OF CONDUCT OR RESTRICTIONS SET FORTH IN SECTION 3.3.2, NON-COMPLIANCE WITH CRIMINAL LAW, AND NON-COMPLIANCE WITH IMMIGRATION LAW OR REGULATIONS. Contractor shall place similar language in its subcontract agreements, requiring its Subcontractors and Sub-subcontractors to be responsible for their own forces, and Contractor shall cooperate with the Owner to ensure Subcontractor and Sub-subcontractor compliance.

§ 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. Copies of inspection reports, photographs or other related records shall be made available to the Owner for review if requested. Reports and documentation shall be formatted and developed in a logical format indicating dates, time of day, findings and the person performing the inspection.

§ 3.3.4 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 the 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.

§ 3.3.5 The Contractor has the responsibility to ensure that all materials suppliers and Subcontractors, Sub-subcontractors, suppliers, and their agents, and employees adhere to the Contract Documents, and that they order materials on time, taking into account the current market and delivery conditions and that they provide materials on time. The Contractor shall properly and efficiently coordinate the timing, scheduling, and routing of its Work with that of all trades, Subcontractors, and others on the Project including deliveries, storage, installations and construction utilities. The Contractor shall be responsible for the space requirements, locations, and routing of all materials and equipment required under the Agreement or other Contract Documents. In areas and locations where the proper and most effective space requirements, locations, and routing cannot be made as indicated, the Contractor shall meet with all others involved, before installation, to plan the most effective and efficient method of overall installation.

§ 3.3.6 Contractor acknowledges that the Work may be performed in connection with a facility which may be currently occupied and in use. It is imperative that Contractor's operations and the performance of the Work not interfere with, interrupt, disturb, or disrupt Owner's normal operations or facilities. Contractor agrees to and shall comply with all rules, regulations and requirements of the Owner and the facility on which the Work is to be

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performed and shall take all steps necessary to protect and guard the safety of the employees, students and invitees of Owner. Contractor shall exercise the utmost skill and judgment to ensure that continuing construction activity will not interfere with the use, occupancy and quiet enjoyment of facilities in use on the site. Contractor recognizes that the ongoing activities in proximity with its construction activities shall result in the need for prompt and effective coordination of its services with those involved in the ongoing utilization of the premises. Such coordination and adequate site access shall be the responsibility of Contractor. When Work occurs in existing facilities, Contractor understands and accepts the cost and schedule impacts associated with work in existing facilities and the potential delays and disruptions to the progress of the Work and has considered such delays and disruptions in the Contract Sum. The Contractor shall perform all the Work in such a manner as to cause minimum interference with the operations of the Owner and other Contractors and Subcontractors on the site, and shall take, and cause the Contractor's and its Subcontractor's employees, agents, licensees and permittees to take all necessary precautions to protect the Work and the site and all persons and property thereon from damage or injury. Contractor shall not request access to the Project, or request the presence of the Owner or presence of Owner's Consultants during non-working times unless the Contractor has demonstrated full-time, fully staffed performance of the Work during Regular Workdays. Owner shall not be obligated to comply with properly submitted requests.

§ 3.3.7 Representatives of the Owner, Contractor, and Architect shall meet periodically at mutually agreed upon intervals, for the purpose of establishing procedures to facilitate cooperation, communication, and timely responses among the participants. By participating in this arrangement, the parties do not intend to create additional contractual obligations or modify the legal relationships which may otherwise exist.

§ 3.3.8 The Owner may require that the Contractor use and/or respond to certain Owner-furnished forms or inquiries during the course of the Project. From time to time, there may be future revisions, changes, additions or deletions to these forms. The fact that the Owner modifies and increases reasonable reporting requirements shall not serve as the basis for a claim for additional time or compensation by the Contractor.

§ 3.3.9 In the event Contractor shall fall behind schedule at any time, for any reason, Owner shall be entitled to direct acceleration or resequencing of the Work to bring the Work back on schedule. Contractor shall be entitled to compensation for such acceleration only (a) to the extent necessitated by excusable and compensable delays, and (b) to the extent of premium pay and additional equipment cost actually incurred by Contractor. In the event Contractor determines that the Scheduled Completion Date cannot be met by resequencing the Work, then Contractor shall immediately provide to the Owner, and in any event within seven (7) days after the date of receipt of any request by Owner for resequencing or acceleration, a plan to complete the Work in the shortest possible time. No approval by the Owner of any plan for resequencing or acceleration of the Work submitted by Contractor pursuant to this paragraph shall constitute a waiver by Owner of any damages or losses which Owner may suffer by reason of such resequencing or the failure of Contractor to meet the Scheduled Completion Date.

§ 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.

§ 3.4.1.1 The Contractor and any Subcontractor or Sub-subcontractor on the Project shall properly classify, as an employee or an independent contractor, in accordance with the Fair Labor Standards Act, its implementing regulations, and Texas Labor Code Section 214.008, any individual the Contractor, Subcontractor, or Sub-subcontractor directly retains and compensates for services performed in connection with the Contract. Any Contractor, Subcontractor, or Sub-subcontractor who fails to properly classify such an individual may be subject to the penalties of Texas Labor Code Sec. 214.008(c).

§ 3.4.1.2 Attention is called to the Government Code, Chapter 2258, Prevailing Wage Rates. Among other things, this Article provides that it shall be mandatory upon the Contractor, and upon any Subcontractor and Sub-Subcontractor under the Contractor, to pay all laborers, workers, and mechanics employed or utilized by them in the execution of the Contract not less than the prevailing rates of per diem wages for work of a similar character in the locality at the time of construction.

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§ 3.4.1.3 In accordance therewith Texas Government Code Section 2258 et seq.; Texas Labor Code Section 62.051 et seq, the Owner has established a scale of prevailing wages which is incorporated in the Contract Documents, and not less than this established scale must be paid on the Project. Any workers not included in the schedule shall be properly classified and paid not less than the rate of wages prevailing in the locality of the Work at the time of construction. Wages listed are minimum rates only, and payment greater than the prevailing wage is not prohibited. No claims for additional compensation above the Contract Sum shall be considered by the Owner because of payments of wage rates in excess of the applicable rates provided herein. If no schedule of prevailing wage rates is included in the Contract Documents, then the parties shall, at a minimum, use the wage rates determined by the U.S. Department of Labor for projects located in the County in which the Project is located in accordance with the Davis-Bacon Act, 40 USC3141-3148, which can be accessed on the internet at https://sam.gov/content/wage-determinations, or the wage rates determined by any local contractor association, whichever is higher..

§ 3.4.1.4 The Contractor and each Subcontractor and Sub-Subcontractor shall keep a record showing the name and occupation of each worker employed by the Contractor, Subcontractor, or Sub-subcontractor in the construction of the Work and the actual per diem wages paid to each worker. Owner reserves the right to receive and review payroll records, payment records, and earning statements of employees of Contractor, and of Contractor's Subcontractors and Sub-subcontractors. These records shall be maintained and made accessible for no less than three (3) years following the date of Final Completion.

§ 3.4.1.5 A Contractor or Subcontractor or Sub-Subcontractor who violates the requirements of Sections 3.4.1.2 or 3.4.1.3 shall pay to Owner the sum of Sixty Dollars and No/100 ($60.00) for each laborer, worker, or mechanic employed for each calendar day or part of the day that the laborer, worker, or mechanic is paid less than the wage rate stipulated in the scale of prevailing wages applicable to the Project, as required by Texas Government Code Section 2258.023(b).

§ 3.4.1.6 In the event of a complaint of a breach of the requirements in Sections 3.1.6 or 3.4.1, et seq, the Owner shall have the right to make a determination as provided by law, and to retain any amount due under the Contract pending a final determination of the violation. Owner may conduct, at its discretion, wage-related interviews of any worker at the sites of the Work without prior warning to the Contractor or Subcontractor or Sub-Subcontractor.

§ 3.4.1.7 In the event of a strike or stoppage of Work resulting from a dispute involving or affecting the labor employed by the Contractor or any of its Subcontractors or Sub-subcontractors, Owner may, at its option and without any notice required by the Contract, terminate the Contract for default unless the Contractor remedies the strike of Work or Work stoppage or other disruption within twenty (20) calendar days after the dispute arises.

§ 3.4.1.8 The Contractor shall require all Subcontractors and Sub-Subcontractors to comply with the provisions of this Section 3.4.1 and its subparts.

§ 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 prior written consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive. Any such substitution request shall be made to the Architect within fifteen (15) days after execution of the Contract.

.1 Substitutions and alternates may be rejected without explanation and will be considered only under one or more of the following conditions: (i) the proposal is required for compliance with interpretation of code requirements or insurance regulations then existing; (ii) specified products are unavailable through no fault of the Contractor; (iii) and when, in the judgment of the Owner or the Architect, a substitution would be substantially in the Owner's best interests in terms of cost, time, or other considerations.

.2 The Contractor must submit to the Architect and the Owner (i) a full explanation of the proposed substitution and submittal of all supporting data, including technical information, catalog cuts, warranties, test results, installation instructions, operating procedures, and other like information necessary for a complete evaluation for the substitution; (ii) a written explanation of the reasons the substitution is necessary, including the benefits to the Owner and the Work in the event the substitution is acceptable; (iii) the adjustment, if any, in the Contract Sum; (iv) the adjustment, if any, in the Contract Time and the construction schedule; and (v) an affidavit stating the (a) proposed

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substitution conforms to and meets all requirements of the pertinent Specifications and the requirements shown on the Drawings, and (b) the Contractor accepts the warranty and correction obligations and will coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be completed in all respects as if originally specified by the Architect. Proposals for substitutions shall be submitted in triplicate to the Architect and the Owner in sufficient time to allow the Architect and the Owner no less than twenty-one (21) Business Days for review, unless a shorter time is agreed upon in writing. No substitutions will be considered or allowed without the Contractor's submittals of complete substantiating data and information as stated herein.

.3 Whether or not the Owner or the Architect accepts any proposed substitution, the Contractor shall reimburse the Owner for any fees charged by the Architect or other consultants for evaluating each proposed substitute.

§ 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 qualified by training and experience and skilled in tasks assigned to them. The Contractor shall only employ or use labor in connection with the Work capable of working harmoniously with all trades, crafts, and any other individuals associated with the Project. The Contractor shall furnish Owner, on request, resumes of the Contractor's key personnel involved in the day-to-day Work on the Project, as well as a list of all engineers, consultants, subcontractors and suppliers involved in construction. At the written request of the Owner or Architect, the Contractor shall not use in the performance of the Work any engineer, consultant, or employee of the Contractor, Subcontractor or Sub-subcontractor reasonably deemed by Owner to be incompetent, careless, unqualified to perform the Work assigned to him, insubordinate, in violation of any provision in the Contract Documents, or otherwise unsatisfactory to Owner. Contractor shall engage sufficient workers on the Project at all times for the proper coordination and performance of the Work in the time periods required by the Contract. This provision is applicable to Subcontractors, Sub-subcontractors and their employees.

§ 3.4.4 Identification of Employees. Contractor shall require all construction workers, whether Contractor's own forces, or the forces of Contractor's subcontractors, to wear identification tags on the front of their persons during all times that they are on Owner's property. Such identification tags shall have identification of the construction worker by number or other identifying medium in a typeface large enough to be seen from eight feet away if requested to do so.

§ 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 the Work the Contract Documents require or permit. The Contractor further warrants that the Work will be performed and completed in a good and workmanlike manner, continuously and diligently in accordance with the Contract Documents, all applicable building codes, and generally accepted standards of engineering and construction practice for construction of projects similar to the Project, except to the extent the Contract Documents expressly specify a higher degree of finish or workmanship, in which case the standard shall be the higher standard. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse by parties other than Contractor, alterations to the Work not executed by the Contractor, improper or insufficient maintenance (unless such maintenance is Contractor's responsibility), improper operation by parties other than the Contractor, or normal wear and tear and normal usage, but such exclusions shall only apply after Owner has taken occupancy of the portion of the Project at issue. If required by the Architect or the Owner, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. Warranties shall become effective on a date established by the Owner and Architect in accordance with the Contract Documents. Notwithstanding anything in the Contract Documents to the contrary, Owner and Contractor expressly agree that the warranties stated herein shall mean the individual warranties associated with each particular Work or designated portion thereof within the Project, and each such individual warranty shall run from the date of Substantial Completion of the entire Work (unless otherwise expressly provided in the applicable Contract Documents for that particular Work). Such warranty shall be maintained notwithstanding that certain systems may be activated prior to Substantial Completion as required for the satisfactory completion of the Project. Contractor's warranties herein shall be interpreted to require Contractor to replace defective materials and equipment and re-execute defective Work which

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is disclosed to the Contractor by the Owner within a period of one (1) year after Substantial Completion of the entire Work or designated portion thereof or, if latent defect, within one (1) year after discovery thereof by Owner. The Contractor shall perform all work reasonably required, to correct Work with errors, omissions, defects or deviations from what is required by the Contract Documents, at no cost to Owner. The warranties set out in this subparagraph are not exclusive of any other warranties, remedies or guarantees set out in other places in the Contract Documents or implied under applicable law, but are in addition to and not in limitation of any other such warranties, remedies, or guarantees.

§ 3.5.2 The Contractor agrees to assign to the Owner at the time of Final Completion of the Work, such assignment to be effective no later than Final Completion, any and all third-party warranties relating to materials, equipment, machinery, components, and labor used in the Work and further agrees to perform the Work in such manner so as to preserve any and all such third-party warranties. Contractor shall take no action or fail to act in any way which results in the termination or expiration of any such third-party warranties or which otherwise results in prejudice to the rights of Owner under such warranties. Contractor's warranties shall in no way limit or abridge the warranties of the manufacturers and suppliers of equipment and systems which are to comprise a portion of the Work and all such warranties shall be in form and substance as required by the Contract Documents. Contractor agrees to provide all notices required for the effectiveness of such warranties and shall include provisions in the contracts with Subcontractors and Sub-subcontractors and other 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.

§ 3.5.3 The warranty(ies) provided in Section 3.5 and its subparts, including but not limited to Section 3.5.1, shall be interpreted to require Contractor to address failure, errors, omissions, defects, deviations, or other nonconformities of materials, products, or workmanship, defective materials and equipment and re-execute defective Work which is disclosed to the Contractor by the Owner or discovered by the Owner within a period of one (1) year after Substantial Completion of the entire Work or, if latent defect, within one (1) year after discovery thereof by Owner. Upon written notice from the Owner of any defects covered by warranty, the Contractor shall promptly remedy any such defects. If Contractor does not respond to Owner's written notice, either by beginning corrective work or notifying Owner in writing stating when work will begin, within ten (10) days of receipt of the notice or such shorter time as required in the Contract Documents, the Owner may take measures to correct the defects and Contractor will be obligated to reimburse the Owner's costs. Any measures taken by Owner to correct defects due to Contractor's failure to timely respond to Owner's written notice shall not operate to void or otherwise alter any warranties issued by, for, or through the Contractor. 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 will extend beyond the applicable warranty period until the warranty defect is remedied and accepted by the Owner. The provisions of this subparagraph shall be in addition to, and not in lieu of, any other rights and remedies available to Owner. The Owner will determine and assign the warranty priority as follows:

§ 3.5.3.1 Priority 1 - A complete shutdown situation. Owner is unable to operate. Safety or loss of building contents anticipated. Unless shorter response durations exist in the Contract Documents, the Contractor shall provide warranty repair service within 8-hours' notice for warranty notice for the following:

1. Cooler and freezer equipment;
2. Chiller and pumps;
3. Boiler and pump;
4. Lift station;
5. Generator;
6. Elevator;
7. Roof leaks
8. Fire alarm and fire sprinkler malfunction

§ 3.5.3.2 Priority 2 - A major component of Owner ability to operate is affected. Some aspects of the operation can continue but issue is a major problem. Unless shorter response durations exist in the Contract Documents, the Contractor shall provide warranty repair service within 24-hours' notice.

§ 3.5.3.3 Priority 3 – Owner operation is unaffected, but the issue is affecting efficient operation by one or more people. Unless shorter response durations exist in the Contract Documents, the Contractor shall provide warranty repair service within 5-working days' notice.

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§ 3.5.3.4 Priority 4 – The issue is an inconvenience or annoying but there are clear workarounds or alternates. Unless shorter response durations exist in the Contract Documents, the Contractor shall provide warranty repair service within 10-working days' notice.

§ 3.5.4 The Contractor shall issue in writing to the Owner as a condition precedent to final payment a "General Warranty" reflecting the terms and conditions of Sections 3.5.1, 3.5.2, and 3.5.3 for all Work under the Contract Documents. This General Warranty shall be assignable.

§ 3.5.5 Except when a longer warranty time is called for in the Contract Documents or is otherwise provided by law, the General Warranty shall be for twelve (12) months from the date of Substantial Completion of the entire Work and shall be in form and content otherwise satisfactory to the Owner. Contractor shall maintain a complete and accurate schedule of the date(s) of Substantial Completion, date(s) upon which the one-year warranty will expire, and date(s) of Final Completion. Contractor agrees to provide notice of the warranty expiration date to Owner and Architect at least one month prior to the expiration of the one-year warranty period. Prior to termination of the one year warranty period, Contractor shall accompany the Owner and Architect on re-inspection of the Work/building and be responsible for correcting any deficiencies not caused by the Owner or by the use of the building which are observed or reported during the re-inspection. Additionally, for a period beginning at Substantial Completion of any phase of the Work and extending twelve (12) months beyond Final Completion of any phase of the Work, upon request of the Owner, the Contractor shall, not less than once a month, attend a meeting with the Owner to review the facility operations and performance to identify defects, warranty issues, and proposed corrections; and to make appropriate written recommendations to the Owner. 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 three (3) 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. If Contractor fails to provide notice of the expiration of the one-year warranty period at least one month prior to the expiration date, Contractor's warranty obligations described in this paragraph shall continue until such inspection is conducted and any deficiencies found in the inspection are corrected.

§ 3.5.6 Warranties shall become effective on a date established by the Owner and Architect in accordance with the Contract Documents. This date shall be the Date of Substantial Completion of the entire Work, unless otherwise provided in any Certificate of Partial Substantial Completion approved by the parties, except for work to be completed or corrected after the date of Substantial Completion and prior to final payment. Warranties for work to be completed or corrected after the date of Substantial Completion and prior to final payment shall become effective on the later of the date the work is completed or corrected and accepted by the Owner and Architect or the date of final payment.

§ 3.5.7 In the event an item under warranty fails, the Contractor shall extend the original warranty period by a length of time equal to the elapsed time which occurs from the notification in writing by the Owner or a warranty claim until acknowledgement by the Owner that the claim has been resolved.

§ 3.5.8 The warranties of Contractor in this Section 3.5 and its subparts shall in no way limit or abridge the warranties of the suppliers or manufacturers of equipment or 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 not engage in any act or conduct, whether by commission or omission that results in the termination or expiration of such third party warranties or which otherwise operates to prejudice the rights of Owner under such warranties.

§ 3.5.9 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 standards; 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 standards; or (3) such further reasonable proof as is required by the Architect. Contractor shall also certify that the Project has been constructed in general conformance with the Architect's or Engineer's plans, specifications, and Construction Documents, as modified from time to time pursuant to the terms of the Contract Documents. Contractor shall complete all applicable certifications required by 19 Texas Administrative Code Section 61.1036-1040.

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§ 3.6 Taxes

Contractor shall pay all applicable local, county and state taxes, income tax, compensation tax, social security and withholding payments as required by law. Owner is an exempt entity under the tax laws of the State of Texas, and Contractor shall not include in the Contract Sum or any Modification any amount for any taxes from which the Owner is exempt by virtue of its status as a governmental entity and/or as a Texas independent school district. The Owner represents that this Project is eligible for exemption from the State Sales Tax on tangible personal property and material incorporated in the Project, provided that the Contractor fulfills the requirements of the Limited Sale, Excise and Use Tax Rules and Regulations. For the purpose of establishing exemption, it is understood and agreed that the Contractor may be required to segregate materials and labor costs at the time a Contract is awarded. Contractor will accept a Certificate of Exemption from the Owner. Contractor shall obtain Certificates of Resale from its suppliers. Failure of Contractor or any Subcontractor or Sub-subcontractor to obtain Certificates of Resale from their suppliers shall make the Contractor, Subcontractor, or Sub-subcontractor responsible for absorbing the tax, without compensation from Owner. CONTRACTOR HEREBY RELEASES, INDEMNIFIES AND HOLDS HARMLESS OWNER FROM ANY AND ALL CLAIMS AND DEMANDS MADE AS A RESULT OF THE FAILURE OF CONTRACTOR OR ANY SUBCONTRACTOR OR SUB-SUBCONTRACTOR TO COMPLY WITH THE PROVISIONS OF ANY OR ALL SUCH LAWS AND REGULATIONS.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 After the Architect has filed the plans and specifications with the Texas Department of Licensing and Regulation, the Architect shall notify Contractor that Contractor may make and submit the applications for the building permit. 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. The Contractor shall procure (as required by the Contract Documents) all certificates of inspection, use; occupancy, permits and licenses, pay all charges, deposits and fees and give all notices necessary and incidental to the due and lawful prosecution of the Work, Certificates of inspection, use and occupancy shall be delivered to the Architect upon completion of the Work in sufficient time for occupation of the Project in accordance with the approved schedule for the Work. The costs of such procurement, payment and delivery are included within the Contract Sum, and constitute Costs of the Work unless otherwise provided by the Contract Documents.

§ 3.7.1.1 The Contractor shall be responsible for timely notification to and coordination with all utility companies regarding the provision of services to the Project. The Contractor shall immediately inform the Architect when the Owner's participation is required, and the Architect will notify the Owner. Connections for temporary and permanent utilities, utility district/company inspections, tap charges, water meter charges, and any other similar fees assessed by jurisdictional authorities having control over the Project, as well as payment for temporary utilities services required for the Work, whether the Work is new construction or renovation of an existing facility, are the direct responsibility of the Contractor, without reimbursement from Owner, unless otherwise agreed in writing. If the Work is new construction, then payment for temporary and permanent utility services shall be the direct responsibility of the Contractor, without reimbursement from Owner, until the latter of completion of commissioning or Substantial Completion.

§ 3.7.1.2 After consultation with the Owner, the Contractor shall obtain all permits and approvals for itself and the Owner, and pay all fees and expenses, if any, associated with National Pollutant Discharge Elimination System (NPDES) regulations administered by the Environmental Protection Agency (EPA) and local authorities, if applicable, that require completion of documentation and/or acquisition of a "Land Disturbing Activities Permit" for the Project. Also, after consultation with the Owner, the Contractor shall obtain all permits and approvals, and pay all fees and expenses, if any, associated with Storm Water Pollution Prevention and Pollution Control Plan (SWPPP) regulations administered by the Texas Commission on Environmental Quality (TCEQ) and local authorities. Contractor shall coordinate processing all forms and fees with the Owner. Contractor's obligations under this Section may or may not require it to obtain or perform engineering services during the pre-construction phase to prepare proper drainage for the construction site. Any drainage alterations made by Contractor during the construction process, which require the issuance of a permit, shall be at Contractor's sole cost. Reimbursable expenses shall not include any fines or penalties assessed against the Contractor, Contractor's Subcontractors or Sub-subcontractors, the Project, or the Owner

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§ 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. In addition, Contractor shall authorize posting of any notices concerning the Workers Compensation insurance carried by other parties involved in the Project, including without limitation, Architect, at the same location where Contractor posts notices regarding Workers Compensation. If applicable, the Contractor shall procure and obtain all bonds required of the Owner or the Contractor by the municipality in which the Project is located or by any other public or private body with jurisdiction over the Project. In connection with such bonds, the Contractor shall prepare all applications, supply all necessary back-up material and furnish the surety with any required personal undertakings. The Contractor shall also obtain and pay all charges for all approvals for street closings, traffic control, parking meter removal and other similar matters as may be necessary or appropriate from time to time for the performance of the Work.

§ 3.7.3 If the Contractor performs Work when Contractor knows or reasonably should have known it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, the Contract Documents, or lawful orders of public authorities, the Contractor shall assume all 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 within forty-eight (48) hours after first observance of the conditions. Contractor agrees that this is a reasonable notice requirement. 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, performance of any part of the Work, will recommend to the Owner 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. The Owner will then consider the facts and the reports of the Architect and the Owner will make the final determination of action. If the Contractor disputes the Owner's determination, the Contractor 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 in writing. 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.

§ 3.8 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. The inclusion of any Allowance or Contingency is solely for the benefit of the Owner. Expenditure of any Allowance or Contingency may only be made with prior written approval of the Owner and according to the procedures of Article 7. Owner's authorized representative may approve any expenditure from Allowances without further Board approval. If the Allowances or Contingency are not expended or not fully expended, then any unused portion shall belong to the Owner and shall be credited to the Owner in calculating Final Payment.

§ 3.8.2 Calculation of costs or credits for Allowances shall be as described in article 7.1.4.

§ 3.8.3 Materials and equipment under an Allowance shall be selected by the Owner with reasonable promptness.

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§ 3.8.4 When performing Work under Allowances, Contractor shall solicit and receive not less than three written proposals, unless the requirement to obtain proposals is waived by the Owner in advance, and shall provide the Work as directed by the Architect, upon Owner's written approval, on the basis of the best value to the Owner.

§ 3.9 Superintendent and Project Manager

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site at all times during performance of the Work. In addition, the Contractor may employ a project manager and necessary assistants who may supervise several Project sites. The list of all supervisory personnel, including the project manager and superintendent, that the Contractor intends to use on the Project and a chain-of-command organizational chart shall be submitted to the Owner and Architect. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor. Important communications shall be similarly confirmed in writing. Other communications shall be similarly confirmed on written request in each case. Questions about plan interpretation or directions shall be submitted to the Architect in the form of a written request for information and the Architect shall respond to such request for information in a reasonable and timely fashion. Contractor's selection of project manager or superintendent(s) shall be approved by Owner. The Contractor shall not engage supervisory personnel or utilize an organization and chain-of-command other than as approved by Owner and Architect, and Contractor shall not replace the project manager or superintendent(s) without Owner's consent or until a replacement project manager or superintendent(s) has been selected in accordance with this Section. The Owner may reject or require removal of any job superintendent, project manager or employee of the Contractor, Subcontractor or Sub-Subcontractor involved in the Project.

§ 3.9.2 Contractor's superintendent shall be present full-time on the site as soon as possible after commencement of the Work, and shall remain assigned to the Work, throughout the course of the Work until items requiring completion or correction, identified at Substantial Completion pursuant to Section 9.8, have been completed or corrected. From Substantial Completion until Final Completion, the superintendent shall be on the site to ensure that Final Completion occurs within the number of days required by the Agreement.

§ 3.9.3 Contractor's project manager, while not required to be present full-time at the site, shall remain assigned to the Work, and be available on an as-needed basis throughout the course of the Work until items requiring completion or correction, identified at Substantial Completion pursuant to Section 9.8, have been completed or corrected in accordance with the Construction Documents.

§ 3.9.4 Owner shall be notified not less than 24 hours before any time that superintendent will not be present at the site for any reason except periodic illness. If the reason is due to illness, then Owner shall be notified at the beginning of that day. Owner shall be notified of the identity of the acting superintendent. In the event the superintendent is absent from the site and notice has not been provided nor has an acting superintendent been assigned to the Work, then an amount equal to the superintendent's daily rate shall be deducted from the amount owed to the Contractor under General Conditions for such day.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, but in no case prior to the first application for payment, shall submit for the Owner's and Architect's review and approval a Contractor's construction schedule for the Work. The schedule shall be transmitted in the form of Microsoft Project in the native file format. 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 and Final Completion; (2) an apportionment of the Work by construction activity; (3) the time required for completion of each portion of the Work; (4) predecessors and successors; (5) phases; (6) baseline start and stop dates; (7) actual start and stop dates; (8) current start and stop dates; (9) delays; (10) critical path; (11) submittals; (12) extensions of the Contract Time authorized by Change Orders, (13) anticipated Adverse Weather Days, (14) Anticipated Instructional Days, and (15) Owner activities. The schedule shall provide for the orderly progression of the Work to completion and 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 and, upon such revision, shall be submitted to Architect and Owner for their review and approval. In no case will the schedule be updated less frequently than each application for payment. The Contractor's schedule may be considered when evaluating a request for additional time.

.1 If any updated schedule exceeds the time limits set forth in the Contract Documents for completion of the Work, the Contractor shall include with the updated schedule a statement of the reasons for the

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anticipated delay in completion of the Work and the Contractor's planned course of action for completing the Work within the time limits, inclusive of previously accepted time extensions, set forth in the Contract Documents. If the Contractor asserts that the failure of the Owner or the Architect to provide information to the Contractor is the reason for anticipated delay in completion, the Contractor shall also specify what information is required from the Owner or Architect.

§ 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 and Owner'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 to prioritize submittals in a manner that aligns with the critical path, key milestones and activities of the Project, (2) indicate compliance with the requirement that the Contractor attain at least 80% completion of the submittals (by quantity) by the time the Contract Sum to date has attained 20% total completed and stored to date, and (3) allow the Architect and Owner 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, and the Owner may withhold progress payments until the conditions of this Article are satisfied. 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. 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.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to and approved by the Owner and Architect. Submission of any schedule under this Contract constitutes a representation by the Contractor that: (1) the schedule represents the sequence in which the Contractor intends to prosecute the remaining Work; (2) the schedule represents the actual sequence and durations used to prosecute the completed Work; (3) that to the best of its knowledge and belief the Contractor is able to complete the remaining Work in the sequence and time indicated; and, (4) that the Contractor intends to complete the remaining Work in the sequence and time indicated.

§ 3.10.4 The Contractor shall hold weekly progress meetings at the Project site, or at such other time and frequency as are acceptable to the Owner.

§ 3.10.5 If reasonably required by Owner, Contractor shall also prepare and furnish project cash flow projections, manning data for critical activities, and schedules for the purchase and delivery of all critical equipment and material, together with periodic updating thereof.

§ 3.10.6 The Contractor shall recommend to the Owner and to the Architect a schedule for procurement of long-lead time items which will constitute part of the Work as required to meet the project schedule.

§ 3.10.7 In addition to the requirements of the Contract Documents, the Contractor's submittal schedule shall include submittals required for Substantial and Final Completion, as described by the Contract Documents, including but not limited to (1) individual specification section-required warranties, (2) certificates, (3) statements, (4) third-party tests.

§ 3.10.8 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 the calendar year. Those needs are reflected in scheduled 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 and the importance of meeting milestones and completion dates is not exclusive.

§ 3.11 Documents and Samples at the Site

§ 3.11.1 The Contractor shall make available, at the Project site, one record copy of the Contract Documents, including Drawings, Specifications, Addenda, Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, including concealed mechanical, electrical and plumbing items inside of the facility and underground utilities at the site, and one record copy of the approved Shop Drawings, field test records, inspection certificates or

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records, manufacturers' certificates, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner at all times. At the completion of the Project, all such documents and records shall be delivered to the Architect, with all changes made during construction, in an editable CAD format agreed to at the beginning of the Project along with (3) full sets of hard copy drawings and one digital copy in PDF format, for submittal to the Owner upon completion of the Work as a record of the Work as constructed, and shall be signed by the Contractor certifying to Owner thereby that they show complete and "as-built" conditions, stating sizes, kinds of materials, vital piping, conduit locations, and similar matters. These documents are to be considered part of the Work beyond the General Conditions. Other than Project identification, the documents shall not bear any professional seal or information or any reference to those firms providing professional services to the Owner, except for historical or reference purposes. This shall be completed and up to date within (30) working days from Substantial Completion and shall be a condition precedent to Final Payment.

§ 3.11.2 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 their respective agents.

§ 3.11.3 In addition to any other requirement in the Contract Documents and prior to installation, at Owner's or Architect's request, Contractor shall furnish or cause a Subcontractor or Sub-subcontractor to furnish, for the Owner's 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.

§ 3.12 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.

§ 3.12.4.1 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 10 business days for the Architect or his Consultants' review and submittals shall be sequenced logically in accordance with the schedule, required fabrication and installation time. For submittals delivered by electronic transmission and received after 5:00 p.m. on a day on which the recipient's offices are open, or on a weekend, Holiday, or other day on which the recipient's offices are closed, submittals shall be deemed to have been duly served on the next day on which the recipient's offices are open.

§ 3.12.4.2 The Contractor shall be prepared to submit color Samples on any key items (such as quarry tile, vinyl wall covering, etc.) within fifteen (15) days of the award of Subcontract(s). All color Samples required for the Work shall be received by the Architect no later than sixty (60) days of the date of the approval of the Contract Sum. Once samples of all key items are received, the Architect will finalize color selections.

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§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect and Owner, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect and Owner or, in the absence of an approved submittal schedule, as required under the Contract Documents. At a minimum, Contractor shall submit all submittals 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.

§ 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. If, in the opinion of the Architect or Owner, the Shop Drawings are (a) incomplete, (b) indicate an inadequate understanding of the Work covered by the Shop Drawings, or (c) indicate a lack of study and review by the Contractor prior to submittal to the Architect, the Shop Drawings will be returned, unchecked, to the Contractor for correction of these deficiencies and subsequent resubmittal. The Architect's review of Contractor's submittals shall be limited to examination of an initial submittal and one (1) re-submittal. The Architect's review of additional submittals will be made only with the consent of the Owner after notification by the Architect. The Owner shall be entitled to reimbursement from the Contractor of amounts paid to the Architect for evaluation of such additional re-submittals.

§ 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 by the Architect and/or Owner.

§ 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 or Owner's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect and Owner of such deviation at the time of submittal and (1) the Architect has given written approval of 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 or Owner's approval thereof except for any such errors or omissions which are within the Architect's statutory or contractual design responsibility..

§ 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 of a resubmission shall not apply to such revisions.

§ 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; however, the Contractor represents and warrants that all Shop Drawings shall be prepared by persons and entities possessing expertise and experience in the trade for which the Shop Drawings are prepared and, if required by the Architect or applicable law, by a licensed architect or engineer.

§ 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 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, 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

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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.

§ 3.12.10.3 A registered architect must prepare plans and specifications for all the Work, as governed by the Texas Occupations Code Chapter 1051; and a registered engineer must prepare plans, specifications and estimates for all Work governed by Texas Occupations Code Chapter 1001. In the event that Contractor retains a licensed design professional under the terms of this section, Contractor shall require that the licensed design professional carry commercial general liability and errors and omissions insurance coverage in the same amounts and forms as required of the Architect on this Project. In the event that the licensed design professional retained by the Contractor will be conducting on-site services or observations, the licensed design professional shall also carry worker's compensation insurance and comprehensive automobile liability in the same amounts and forms as required of the Architect on this Project.

§ 3.12.11 The Contractor shall provide composite drawings within four (4) weeks of corresponding submittals approval showing how all piping, ductwork, lights, conduit and 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 1/4" per foot minimum scale and shall include invert elevations, elevation views and sections required to meet the intended purpose. Trades required to participate include, but are not necessarily limited to structural, mechanical, plumbing, fire sprinkler, electrical, data and special systems.

§ 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.

§ 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 whom the Contractor is responsible shall not erect any sign on the Project site without the prior 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 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 any area and buildings adjacent to the site or the Work. Prior to the start of any Work which may impact or otherwise affect beneficial use or occupancy of an existing facility, the Contractor shall provide a work plan for such Work that identifies and controls any interruption for approval by the Owner. Work in this situation shall not proceed until an agreed plan of Work is approved in writing by the Owner.

§ 3.13.5 Without prior written 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.

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§ 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; provided, however, that any such cutting, fitting or patching can only be performed if the cutting, fitting or patching results in Work that is in accordance with the Contract Documents. 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. Structural members shall not be cut and air duct shapes, piping sizes and related system designed elements shall not be changed or modified except with written permission of the Architect. 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 After installation of the Work, Contractor shall carefully fit around, close up, repair, patch and paint such Work to match adjoining surfaces by use of proper tools and new materials using workers skilled in the required trades. All patching must include replacement or repair of any fire rated assembly to its full rating as required by current codes and standards at the point of Work or as may be required by the building official.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor, on a daily basis, shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. Contractor shall, not less than one time each week, clean up by removing rubbish, including old and surplus materials, to include dirt, debris, or trash. At no time shall trash, dirt or other debris be allowed to remain in any wall cavity, ceiling plenum, crawl space or concealed space. Immediately after unpacking materials, all packing case lumber or other packing materials, wrapping or other like flammable waste shall be collected and removed from the building and premises. Contractor shall provide on-site containers for the collection of waste materials, debris and rubbish, and shall periodically remove waste materials, debris and rubbish from the Work and dispose of all such materials at legal disposal areas away from the site. At completion of the Work, the Contractor shall remove all waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project and shall clean, sweep, mop, brush and polish, as appropriate, the interior of the improvements or renovated areas, including but not limited to, any floors, carpeting, ducts, fixtures, and ventilation units operated during construction. Contractor shall clean exterior gutters, drainage, walkways, driveways and roofs of debris. All cleaning operations shall be scheduled so as to ensure that contaminants resulting from the cleaning process will not fall on newly coated or newly painted surfaces. Care shall be taken by all workers not to mark, soil, or otherwise deface any finish. In the event that any finish becomes defaced in any way as a result of such activities, the Contractor or any of his Subcontractors or Sub-subcontractors shall clean and restore such surfaces to their original condition.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner, at its discretion, may perform the clean-up and withhold costs incurred from funds due to Contractor or, if the costs incurred are in excess of the funds due to the Contractor, may require the Contractor to reimburse the Owner for the costs incurred.

§ 3.15.3 The Contractor shall be responsible for the protection of the Work. Prior to the Architect's inspection for Substantial Completion, the Contractor shall clean exterior and interior surfaces exposed to view; remove temporary labels, stains, putty, soil, paint and foreign substances from all surfaces, including glass and painted surfaces; polish transparent and glossy surfaces; clean equipment and fixtures to a sanitary condition; replace air filters in mechanical equipment; clean roofs, 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; clean and polish all floors; clean and polish all hardware; and repair all Work damaged during cleaning.

§ 3.15.4 Prior to Final Completion, in addition to any additional final cleaning work specified in the Contract Documents (including the Specifications), Contractor shall: (1) employ skilled workers for final cleaning; (2) remove grease, mastic adhesive, dust, dirt, stains, fingerprints, labels and other foreign materials from all sight-exposed interior and exterior surfaces; (3) wash and shine glazing and mirrors; (4) polish glossy surfaces to a clear shine; (5) vacuum clean carpeted and similar soft surfaces; (6) clean (damp mop with clean mop and water) resilient and hard surface floors repeating as necessary until no visible residue remains on floors; (7) clean plumbing fixtures

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to a sanitary condition; (8) clean surfaces of all equipment and remove excess lubrication; (9) clean permanent filters and replace disposable filters in ventilating systems if units were operated during construction and clean ducts, blowers and coils; (10) clean light fixtures; (11) remove waste, foreign matter and debris from roofs, gutters, area ways and drainage ways; (12) remove waste, debris and surplus materials from the site; (13) remove stains, spills and foreign substances from paved areas; and (14) broom clean exterior concrete and paved surfaces and rake clean the grounds.

§ 3.16 Access to Work

The Contractor shall provide the Owner and Architect, and their designated representatives, with access to the Work in preparation and progress wherever located. Upon request of the Architect or Owner, the Contractor shall accompany the Architect or Owner on an inspection of the Work. The presence of the Owner, Architect or their representatives does not constitute acceptance or approval of the Work.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees with respect to the Contract or the Work. THE CONTRACTOR SHALL DEFEND SUITS OR CLAIMS FOR INFRINGEMENT OF COPYRIGHTS AND PATENT RIGHTS, WAIVE AND RELEASE ANY CLAIMS AGAINST THE OWNER AND ARCHITECT WITH RESPECT THERETO, AND INDEMNIFY AND HOLD HARMLESS THE OWNER AND ARCHITECT FROM ANY LOSS ON ACCOUNT THEREOF, PROVIDED, HOWEVER, THAT CONTRACTOR SHALL NOT BE RESPONSIBLE TO ARCHITECT FOR DEFENSE OR LOSS WHEN A PARTICULAR DESIGN, PROCESS, OR PRODUCT OF A PARTICULAR MANUFACTURER OR MANUFACTURERS IS REQUIRED BY THE CONTRACT DOCUMENTS, OR WHERE THE COPYRIGHT VIOLATIONS ARE CONTAINED IN DRAWINGS, SPECIFICATIONS, OR OTHER DOCUMENTS PREPARED BY THE 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 notice of such infringement is promptly furnished to the Owner and Architect in writing.

§ 3.18 Indemnification

§ 3.18.1 TO THE FULLEST EXTENT PERMITTED BY LAW, THE CONTRACTOR SHALL WAIVE AND RELEASE CLAIMS AGAINST AND SHALL DEFEND, INDEMNIFY AND HOLD HARMLESS THE OWNER, ITS TRUSTEES, OFFICERS, AND CONSULTANTS, ARCHITECT, ARCHITECT'S CONSULTANTS, AND AGENTS AND EMPLOYEES OF ANY OF THEM FROM AND AGAINST CLAIMS, DAMAGES, LOSSES, CAUSES OF ACTION, SUITS, JUDGMENTS, 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 (INCLUDING THE WORK ITSELF), INCLUDING LOSS OF USE RESULTING THEREFROM, BUT ONLY TO THE EXTENT CAUSED IN WHOLE OR IN PART BY THE ACTS OR OMISSIONS OF THE CONTRACTOR, A SUBCONTRACTOR, ANYONE DIRECTLY OR INDIRECTLY EMPLOYED BY THEM, ANYONE THEY CONTROL OR EXERCISE CONTROL OVER, 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 ANY ACTS OR OMISSIONS OF OWNER OR OWNER'S CONSULTANTS OR ANY OTHER 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. ALL COSTS AND EXPENSES SO INCURRED BY ANY OF THE INDEMNIFIED PARTIES IN THAT EVENT SHALL BE REIMBURSED BY CONTRACTOR, AND ANY COSTS AND EXPENSES SO INCURRED BY INDEMNIFIED PARTIES SHALL BEAR INTEREST UNTIL REIMBURSED BY CONTRACTOR, AT THE POST-JUDGMENT INTEREST RATE PROVIDED TO BE PAID UNDER THE LAWS OF THE STATE OF TEXAS.

§ 3.18.2 IN CLAIMS AGAINST ANY PERSON OR ENTITY INDEMNIFIED UNDER THIS SECTION 3.18 BY AN EMPLOYEE OF THE CONTRACTOR, A SUBCONTRACTOR, A SUB-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

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OR FOR THE CONTRACTOR OR A SUBCONTRACTOR UNDER INSURANCE POLICIES, WORKERS' COMPENSATION ACTS, DISABILITY BENEFIT ACTS, OR OTHER EMPLOYEE BENEFIT ACTS.

§ 3.18.3
THE OBLIGATIONS OF THE CONTRACTOR UNDER THIS SECTION 3.18 SHALL NOT EXTEND TO THE LIABILITY OF THE ARCHITECT, THE ARCHITECT'S CONSULTANTS, AND AGENTS AND EMPLOYEES OF ANY OF THEM, CAUSED BY OR RESULTING FROM: (1) DEFECTS IN PLANS, DESIGNS, OR SPECIFICATIONS PREPARED, APPROVED, OR USED BY THE ARCHITECT OR ENGINEER; OR (2) NEGLIGENCE OF THE ARCHITECT OR ENGINEER IN THE RENDITION OR CONDUCT OF PROFESSIONAL DUTIES CALLED FOR OR ARISING OUT OF THE CONSTRUCTION CONTRACT AND THE PLANS, DESIGNS, OR SPECIFICATIONS THAT ARE A PART OF THE CONSTRUCTION CONTRACT; AND (3) ARISING FROM: (A) PERSONAL INJURY OR DEATH; (B) PROPERTY DAMAGE; OR (C) ANY OTHER EXPENSE THAT ARISES FROM PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE, OR AS OTHERWISE LIMITED BY TEXAS CIVIL PRACTICE & REMEDIES CODE SECTION 130.001 ET SEQ.

§ 3.18.4 CONTRACTOR SHALL BE RESPONSIBLE FOR AND SHALL HOLD OWNER FREE AND HARMLESS FROM LIABILITY RESULTING FROM LOSS OF OR DAMAGE TO CONTRACTOR'S OR ITS SUBCONTRACTOR'S OR SUB-SUBCONTRACTOR'S CONSTRUCTION TOOLS AND EQUIPMENT AND RENTED ITEMS WHICH ARE USED OR INTENDED FOR USE IN PERFORMING THE WORK REGARDLESS OF WHETHER SUCH LOSS OR DAMAGE IS CAUSED IN PART BY AN ACT OR OMISSION OF OWNER OR ITS AGENTS, OFFICERS, OR EMPLOYEES. THIS PROVISION SHALL APPLY, WITHOUT LIMITATION, TO LOSS OR DAMAGE OCCURRING AT THE WORK SITE OR WHILE SUCH ITEMS ARE IN TRANSIT TO OR FROM THE WORK SITE AND IS IN ADDITION TO CONTRACTOR'S OBLIGATIONS UNDER SECTION 3.18.1.

§ 3.18.5 THE OWNER MAY CAUSE ANY SEPARATE CONTRACTOR WHO MAY HAVE A CONTRACT WITH THE OWNER TO PERFORM CONSTRUCTION OR INSTALLATION WORK IN THE AREAS WHERE WORK WILL BE PERFORMED UNDER THIS AGREEMENT, TO AGREE TO INDEMNIFY AND TO HOLD THE OWNER AND THE CONTRACTOR HARMLESS FROM ALL CLAIMS FOR BODILY INJURY AND PROPERTY DAMAGE TO THE SAME EXTENT AS IS PROVIDED IN SECTION 3.18.1 ABOVE. LIKEWISE, CONTRACTOR AGREES TO INDEMNIFY AND TO HOLD THE OWNER'S SEPARATE CONTRACTORS HARMLESS FROM ALL CLAIMS FOR BODILY INJURY AND PROPERTY DAMAGE TO THE SAME EXTENT AS PROVIDED IN SECTION 3.18.1 ABOVE.

§ 3.18.6 THE CONTRACTOR AGREES TO WAIVE ANY AND ALL CLAIMS IT MAY HAVE AGAINST THE OWNER, CONNECTED WITH, RESULTING FROM, OR ARISING OUT OF, CLAIMS AND SUITS COVERED BY THE INDEMNIFICATION AGREEMENT CONTAINED HEREIN AND AGREES THAT ANY INSURANCE POLICY SHALL PROVIDE FOR THE WAIVER OF SUBROGATION RIGHTS AGAINST THE OWNER.

§ 3.18.7 To the extent allowed by law, the Contractor agrees to insure the indemnity and hold harmless clauses contained in this Section 3.18, including its subparts, with insurance policies, approved by the Owner, and issued by a carrier authorized to do business in the State of Texas, in the minimum amounts set out in Article 11 and/or Section 11.1 of these General Conditions.

§ 3.18.8 The provisions of Section 3.18 in its entirety, including all of its subparts, shall survive the completion, termination, or expiration of the Contract, howsoever caused, and no payment, partial payment, nor issuance of a certificate of Substantial Completion nor a certificate of Final Completion nor acceptance of occupancy in whole or in part of the Work shall waive or release any of the provisions of Section 3.18 and its subparts.

§ 3.19 Antitrust Violation

To permit the Owner to recover damages suffered in antitrust violations, Contractor hereby assigns to Owner any and all claims for overcharges associated with this Contract which violate the antitrust laws of the United States, 15 U.S.C.A. Section 1 et seq. The Contractor shall include this provision in its agreements with each Subcontractor, Sub-subcontractor and supplier. Each Subcontractor shall include such provisions in agreements with sub-subcontractors and suppliers.

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§ 3.20 Record Drawings

§ 3.20.1 At the completion of the Project, the Contractor shall submit complete record drawings, with all changes made during construction, including concealed mechanical, electrical and plumbing items inside of the facility and underground utilities at the site. The drawings shall be submitted in an editable native file format agreed to at the beginning of the project along with (3) full sets of hard copy drawings and one digital copy in PDF format. These documents are to be considered part of the Work beyond the General Conditions. The documents shall not bear any professional seal or information other than project identification. This shall be completed and up to date within (30) working days from Substantial Completion.

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 The Owner shall notify the Contractor when duties, responsibilities, and limitations of authority of the Architect have been modified.

§ 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 duties, responsibilities, or activities of the Architect.

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect or its authorized representative 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 a recommendation that the Final Payment is due, and, with the Owner's concurrence, from time to time during the one-year period for correction of Work described in Section 12.2.. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents or expressly authorized by the Owner in writing.

§ 4.2.2 Architect or its authorized representative shall visit the site at least twice per week (or more per week when deemed necessary by the Owner or when necessary to protect Owner's interests) and at other intervals appropriate to the stage of construction, to inspect the progress, quantity and quality of the Work completed, to reject any observed nonconforming Work, and to determine if the Work is being performed in a manner indicating that the Work, when completed, will be in accordance with the Contract Documents and on time. Furthermore, a minimum of two job site meetings per month from commencement of construction through Final Completion will be initiated by the Architect and attended by the Contractor. Attendees will include the Owner, the Contractor's project manager and/or superintendent, Architect's project representative, and Architect. The Architect, Owner and their representatives shall at all times have access to the Work. Architect or its authorized representative will provide on-site observations prior to and during all concrete pours that contribute to the structural integrity of the building, including all pours of concrete piers, footings, grade beams, floor slabs, and concrete superstructure components, if applicable. In addition, Architect or its authorized representative will provide on-site observations prior to covering up or closing up of portions of the construction which, if covered, would conceal problems with the structural integrity of the Project. Contractor shall provide notice and shall not close or cover said Work until said observations have occurred. Contractor or Architect will advise Owner of the need for any third party laboratory or testing services to assist the Architect and Owner. On the basis of the on-site observations by Architect, Architect shall keep Owner and Contractor informed of the progress and quality of the Work, through Architect's field reports, and shall guard Owner against defects and deficiencies in the Work. Architect shall promptly notify Owner and Contractor orally regarding any defect or nonconforming Work, which shall be followed by notice in writing of defects or nonconforming Work noted and corrective actions taken or recommended. The Architect, however, shall not have control over or responsibility for the Contractor's construction means, methods, techniques, sequences, procedures, or safety programs, but this does not relieve Architect of Architect's responsibilities under the Contract. Any services by Contractor made necessary by Contractor's construction defect or nonconforming Work shall be performed at no additional cost to Owner.

§ 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

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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, Sub-subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work. The Contractor shall reimburse the Owner for compensation paid to the Architect for additional site visits made necessary by the fault, neglect, or request of the Contractor.

§ 4.2.4 Communications

Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized by the Owner or Architect, the Owner and Contractor shall endeavor to communicate with each other through the Architect about matters arising out of or relating to the Contract. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors, Sub 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. Notwithstanding the foregoing, Owner reserves the right to communicate directly with the Contractor and Subcontractors.

§ 4.2.5 As further provided in the Contract Documents, based on the Architect's evaluations of the Work progress and quality of the Work and 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, which shall be further subject to the Owner's review, modification, approval, or rejection.

§ 4.2.6 The Architect and Owner each has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect or the Owner considers it necessary or advisable, the Architect and/or the Owner 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 Work is fabricated, installed or completed. Testing or inspections required by this section shall be conducted subject to the requirements of Chapter 2269 of the Texas Government Code. However, neither this authority of the Architect or the Owner 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 or the Owner to the Contractor, Subcontractors, Sub subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work, or constitute approval or acceptance of Work that is deficient or does not meet the requirements of the Contract Documents. Architect and/or Contractor shall promptly notify, orally and in writing, the other party and Owner of any fault or defect in the Project or Construction Documents or nonconformance with the Contract Documents they may respectively discover (or reasonably should have discovered using ordinary diligence) and each, upon discovery of the defect or nonconformance, shall be responsible for notifying the other party and Owner of those corrective actions they respectively take; provided, however, Contractor shall have no duty to notify Owner of discoveries made or actions taken by Architect. If Architect or Contractor fails to disclose, in writing, any known defects in the Project or Construction Documents it discovers or reasonably should discover using ordinary diligence, the non-disclosing party (Architect and/or Contractor) shall be liable for the consequences of such defects resulting from the failure to disclose. In the event of a disagreement between the Architect and Contractor, the Owner will make the final determination after reviewing all of the information.

§ 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 and all applicable laws, statutes, codes and requirements applicable to Architect's design services. 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 as to cause no delay in the Work or in the activities of the Owner, Contractor, or Separate Contractors, while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is conducted for the general 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. If any submittal does not comply with the requirements of the Contract Documents, then Architect shall require Contractor to come into

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compliance. The Architect shall promptly report in writing to the Contractor and Owner any errors, inconsistencies and/or omissions discovered by the Architect in the Shop Drawings, Product Data and Samples.

§ 4.2.8 The Architect shall review, prepare and make recommendations to Owner regarding all Change Orders and Construction Change Directives for the Owner's approval and execution in accordance with the Contract Documents, accompanied by all supporting documentation. The Architect may authorize minor changes in the Work not involving an adjustment in Contract Sum or an extension of the Contract Time which are consistent with the intent of the Contract Documents. If necessary, the Architect shall prepare, reproduce and distribute Drawings and Specifications to describe Work to be added, deleted or modified, as provided in Section 7.4. The Architect shall accept requests by the Owner, and shall review properly prepared, timely requests by the Contractor for changes in the Work, including adjustments to the Contract Sum or Contract Time. A properly prepared request for a change in the Work by the Contractor shall be accompanied by sufficient supporting data and information to permit the Architect to make a reasonable determination without extensive investigation or preparation of additional drawings or specifications. If the Architect determines that requested changes in the Work are not materially different from the requirements of the Contract Documents and do not change the Contract Sum or Contract Time, then the Architect may issue an order for a minor change in the Work with prior written notice to the Owner, or recommend to the Owner that the requested change be denied. The Architect is not authorized to approve changes involving major systems such as: Heating, Ventilation and Air Conditioning ("HVAC"); roof; foundation; outward appearance; color schemes; floor plans; building materials; drainage; or mechanical equipment without Owner's prior written consent.

§ 4.2.9 The Architect will conduct inspections and, in consultation with the Owner, 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. In the event Architect is required to perform more than two inspection(s) to determine the date or dates of Substantial Completion or Final Completion due to Contractor's failure to meet the conditions for such completion, Contractor shall be responsible for paying or reimbursing Owner for the cost of any Additional Services charged by Architect or Consultants under the agreement between Owner and Architect.

§ 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 make recommendations on matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor, which shall be copied to the other.. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. The Owner will make the final determination of all matters concerning performance after consultation with the Architect.

§ 4.2.12 Interpretations or recommendations 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 recommendations, 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 The Owner's decisions on matters relating to aesthetic effect shall be final if (a) they are consistent with the intent expressed in the Contract Documents, and (b) the Owner gives its written consent.

§ 4.2.14 Contractor is allowed a reasonable number of requests for information that are initiated by Contractor and if Contractor exceeds that reasonable amount, as determined by the Architect, in its sole discretion, Contractor shall pay the Architect's fee for review of any additional requests for information. 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. In the

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event of a disagreement between the Architect and Contractor, the Owner will make the final determination after reviewing all of the information.

§4.2.15 The Contractor shall not cover up work without the Architect and Owner performing an observation of such work. The Contractor shall be responsible for any and all associated costs to allow for observation of the work, uncovered, by the Architect and Owner. If the Contractor covers work without either the consent of the Architect and Owner or without providing the Architect and Owner with reasonable opportunity to observe the work, whether or not such work is found to be acceptable by the Architect or Owner, the Contractor shall repair such work at no cost to the Owner.

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, away from the site, or otherwise to furnish labor or materials. 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. The term "Subcontractor" includes persons supplying materials or equipment for the Work.

§ 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, away from the site, or otherwise to furnish labor or materials.. 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. The term "Sub-subcontractor" includes persons supplying materials or equipment for the Work.

§ 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. All Subcontractors shall be procured in accordance with Texas Education Code Chapter 44, Subchapter B, and Texas Government Code Chapter 2269, as applicable. If Contractor is a Construction Manager at Risk, all trade contractors and Subcontractors shall be procured in accordance with Sections 2269.255 and 2269.256 of the Texas Government Code. A notice of no reasonable objection shall in no way relieve the Contractor from full responsibility for performance and completion of the Work and its obligations under the Contract Documents. The Contractor shall be fully responsible for the performance of its Subcontractors, and Sub-subcontractors, including those recommended or approved by the Owner.

§ 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 and timely 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. When the parties agree on a proposed substitute Subcontractor or if the Owner requires use of a specific Subcontractor, then 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. "Reasonable Objection" shall include, but not be limited to, Owner or Architect's prior experience of unsatisfactory work performed by the Subcontractor or debarment of the Subcontractor.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, Sub subcontractor person, or entity for one previously selected if the Owner or Architect makes reasonable objection to such substitution.

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§ 5.2.5 The Owner may require the Contractor to change any subcontractor or supplier previously approved by it, if such a change is due to failure of subcontractor to perform in accordance with the requirements of the Contract. If Owner requires removal of a subcontractor for such failure to perform, and Contractor reasonably objects to such removal, then Owner will pay any actual increase in the cost between the new subcontractor and the subcontractor replaced incurred by Contractor, taking into account any amounts which Contractor withholds or recovers in damages from the replaced subcontractor. If Contractor requests such payment from Owner, Contractor shall provide Owner with satisfactory proof of such additional costs incurred by Contractor.

§ 5.2.6 Contractor shall be fully responsible for the performance of its subcontractors, including those selected or approved by the Owner.

§ 5.3 Subcontractual Relations

§ 5.3.1 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. The terms and conditions of the Contract Documents shall be incorporated by reference into each subcontract agreement, except as provided below. 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. Each Subcontractor and Sub-subcontractor shall provide proof of insurance to Contractor consistent with the Contractor's insurance to Owner and in amount commensurate with the Work to be performed by the Subcontractor or Sub-subcontractor.

§ 5.3.2 Neither the Owner nor the Architect shall be obligated to pay or to ensure the payment of any monies to Subcontractors or Sub-subcontractor due to any non-payment to the Contractor, non-payment of Subcontractors by the Contractor, or non-payment of Sub-subcontractors by Subcontractors.

§ 5.3.3 The Contractor shall require any potential Subcontractor to disclose to the Contractor any ownership interest or familial relationship between the Contractor, the Architect or the Owner and the potential Subcontractor prior to entering into a subcontract. Contractor shall report to Owner all such disclosures and the Owner shall have the right, in its sole discretion, to reject any such affiliated Subcontractor.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for any unperformed portion of the Work is assigned by the Contractor to the Owner, provided that

- **.1** assignment is effective only after termination of the Contract either in accordance with Article 14 or abandonment of the Project by the Contractor and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor;
- **.2** assignment is subject to the prior rights and obligations of the surety, if any, obligated under bonds relating to the Contract;
- **.3** such assignment shall not constitute a waiver by Owner of any of its rights against Contractor, because of defaults, delays and defects for which a Subcontractor or material vendor may also be liable; and
- **.4** the Subcontractor provides bonds as required by law of prime contractors, and by Owner.

If the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract, provided, however, that Owner does not assume Contractor's obligations or liabilities for defaults occurring prior to Owner's assumption, or for the payment to the Subcontractor or supplier for Work, if payment for such Work has previously been made to Contractor. Such liabilities or obligations shall remain with Contractor. Owner shall only be responsible for compensating Subcontractors for Work performed or materials

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furnished from and after the date on which the Owner gives written notice of its acceptance of the subcontract agreement. Owner shall not be responsible for any Work performed or materials furnished by Subcontractors prior to the date of Owner's written notice of acceptance.

§ 5.4.2 Such assignment shall not constitute a waiver by Owner of any of its rights against Contractor, including, but not limited to, claims for defaults, delays or defects for which a Subcontractor, Sub-subcontractor, or vendor may also be liable.

§ 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.

§ 5.4.4 All subcontracts shall state that they will be assignable to the Bond Trustee or his designee, if funding for the Project is obtained through bond proceeds.

§ 5.5 Notice of Subcontractor Default

Contractor shall promptly notify Owner and Architect in writing of any material defaults by any Subcontractor or Sub-subcontractor. Notwithstanding any provision contained in Article 5 to the contrary, it is hereby acknowledged and agreed that Owner has in no way agreed, expressly or implicitly, nor will Owner agree, to allow any Subcontractor, Sub- subcontractor or other materialman or worker employed by Contractor the right to obtain a personal judgment or to create a mechanic's or materialman's lien against Owner for the amount due from the Owner or the Contractor.

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 construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained for the Project. The Owner further reserves the right to perform other non-Project-related construction work, maintenance and repair work, and school program operations at the site and near the site during the time period of the Work.

§ 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.

§ 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 and submit such revisions to the Owner for the Owner's approval. The construction schedules, if approved by the Owner, 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 rights that the Contractor has under the Conditions of the Contract.

§ 6.2 Mutual Responsibility

§ 6.2.1 It shall be the responsibility of the Contractor to assist, review, and coordinate the scheduling of work performed by any of the Owner's Separate Contractors. In addition, the Contractor shall be responsible for coordinating and providing all construction administration necessary for the Work and the work of any of Owner's Separate Contractors. The Contractor shall afford the Owner and Separate Contractors reasonable site access and opportunity for introduction and storage or staging 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. Contractor shall be responsible for coordination between Contractor's Subcontractors, Sub-subcontractors and Owner's Separate Contractors. Contractor shall review Owner's contract with Owner's Separate Contractors and become familiar with the requirements and scope of services contained therein.

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§ 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 and Owner in writing 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 and shall promptly report in writing to the Architect and Owner if Owner's Separate Contractors otherwise fail in any way to timely perform their services or negatively impact Contractor's schedule or ability to perform the Work. Failure of the Contractor to notify the Architect and Owner 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 and is performed in a timely manner. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not actually known to Contractor and are not reasonably 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 actual costs the Contractor incurs because of a Separate Contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.3.1 If the Architect is required to provide contingent additional services as provided in the Agreement between the Owner and the Architect, specifically relating to additional compensation for the Architect for evaluating an excessive number of claims submitted by the Contractor or others in connection with the Work in accordance with the Owner's Agreement with the Architect, then such services shall be paid for by the Contractor through the Owner, unless the contingent additional services result from negligence or an omission by the Architect.

§ 6.2.3.2 If the Architect provides services in connection with a legal proceeding, except when the Architect is a party thereto, and the Owner requests the Architect in writing to provide such services, then the cost of such services shall be paid for by the party whose act or omission was a proximate cause of the problem that led to the requirement to provide such services. Such services shall be paid for by such party through the Owner, who upon receipt of same shall reimburse the Architect.

§ 6.2.3.3 All construction costs resulting from the Contractor's negligence, lack of oversight, inattention to detail, failure to investigate or failure to follow the Contract Documents, will be borne by the Contractor.

§ 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. If such Separate Contractor initiates a claim or legal or any other proceedings against the Owner on account of any damage alleged to have been caused by the Contractor, the Owner shall notify the Contractor, who shall defend such proceedings at its own expense, and if any judgment or award against the Owner arises therefrom, based on Contractor's act or omissions or the act or omissions of Contractor's employees, Subcontractor, Sub subcontractor, or parties for whom Contractor has liability, the Contractor shall pay or satisfy it and shall reimburse the Owner for all attorneys' fees and court and other costs which the Owner has incurred over and above those paid for directly by the Contractor.

§ 6.2.6 The Contractor shall be responsible for any delays to a Separate Contractor caused by the Contractor or its Subcontractors, Sub-subcontractors, or suppliers.

§ 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 then 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

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limitations stated in this Article 7 and elsewhere in the Contract Documents. A properly prepared written request for a change in the Work by Contractor shall be accompanied by sufficient supporting data and information to permit the Architect to make a recommendation to Owner.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires the approval of the Owner and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued, subject to the Owner's approval, by the Architect alone.

§ 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. Contractor shall not make any claim for an adjustment to the Contract Sum or Contract Time due to: a change in the materials used; a change in the specified manner of constructing and/or installing the Work; or additional labor, services, or materials, beyond that actually required by the terms of the Contract Documents, unless made pursuant to a written order or directive from Owner authorizing Contractor to proceed with a Change in the Work. No claim for an adjustment to Contract Sum or Contract Time shall be valid unless so ordered or directed.

§ 7.1.4 Calculation of costs or credits for Changes, minor changes, Proposals, Contingency expenditures and Allowance expenditures:

1. When calculating the Cost of the Work for Changes, minor changes, Proposals, Contingency expenditures and Allowances, the Contractor shall furnish and include substantiation to satisfaction of the Owner of the following from Subcontractors:

Description of Subcontractor Cost of the Work Element

A Bare Material Costs

B Labor Hours

C Direct Labor Costs (See Article 1 Definitions)

D Labor Cost Burden (See Article 1 Definitions)

E Equipment

F Work performed by Sub-subcontractor (if any), where Sub-subcontractor Overhead and Profit shall not exceed 10%

G Subcontractor's Overhead and Profit, which shall not exceed 10% of A through F

H Contractor's Overhead and Profit, which shall not exceed 10% of A through G. Contractor's Overhead and Profit shall not be applied to Contingency expenditures or Allowance expenditures.

I Cost of the Work (Sum of A through H)

2. When Contractor self performs work, when calculating the Cost of the Work for Changes, minor changes, Proposals, Contingency expenditures and Allowances, the Contractor shall furnish and include substantiation to satisfaction of the Owner of the following:

Description of Contractor Cost of the Work Element

A Bare Material Costs

B Labor Hours

C Direct Labor Costs (See Article 1 Definitions)

D Labor Cost Burden (See Article 1 Definitions)

E Equipment

F Contractor's Overhead and Profit, which shall not exceed 10% of A through E. Contractor's Overhead and Profit shall not be applied to Contingency expenditures or Allowance expenditures.

G Cost of the Work (Sum of A through F)

No additional Fee or General Conditions cost shall apply to self-performed Work.

3. 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.

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§ 7.1.4.1 The Contractor, upon receipt of written notification by the Owner or the Architect of a proposed item of change in the Work, shall prepare within 10 Calendar Days a Change Proposal in such form or forms as directed by the Owner or the Architect.

.1 Each separate Change Proposal shall be numbered consecutively and shall include all cost related to the proposed Change in the Work, including any disruption or impact on performance.

.2 The Subcontractor's itemized accounting shall be included with the Change Proposal;

.3 If a Change Proposal is returned to the Contractor for additional information or if the scope of the proposed Change in the Work is modified by additions, deletions or other revisions, the Contractor shall revise the Change Proposal accordingly and resubmit the revised Change Proposal to the Architect and the Owner;

.4 A revised Change Proposal shall be the original Change Proposal number suffixed by the letter "R" to designate a revision in the original Change Proposal. If additional revisions to a revised Change Proposal are necessary, each subsequent revision shall be identified by an appropriate numeral suffix immediately following the "R" suffix;

.5 Upon written approval of a Change Proposal by Owner, the Architect and the Contractor, the Architect will prepare an Allowance Expenditure Authorization or Change Order authorizing such change in the Work; and

.6 The Contractor shall request extensions of Contract Time due to changes in the Work only at the time of submitting its Change Proposal. Contractor's failure to do so shall represent a waiver of any right to request a Contract Time extension. Any request for extensions of Contract Time must be substantiated through the demonstration of the impact of the proposed item of change in the Work to the critical path schedule for the Project.

§ 7.1.4.2 Formal Notice of Essence. Contractor recognizes and acknowledges that timely submission of a formal Change Proposal, whether or not the circumstances of the Change may be known to the Owner or available to Owner through other means, is not a mere formality but is of crucial importance to the ability of Owner to promptly identify, prioritize, evaluate and mitigate the potential effects of Changes. Any form of informal notice, whether verbal or written (including, without limitation, statements in Requests for Information, statements at regular job meetings or entries on monthly reports, daily logs or job meeting minutes), that does not strictly comply with the formal requirements of Paragraph 7.1.4.1, above, shall therefore be insufficient.

§ 7.1.5 In accordance with Texas Education Code §44.0411 if the Contract Sum is $1,000,000.00 or more, or if the Contract Sum is less than $1,000,000.00, and any Change Order, Construction Change Directives, or other Changes in the Work would increase the Contract Sum to $1,000,000.00 or more, the total of all Change Orders, Construction Change Directives, or other Changes in the Work may not increase the Contract Sum by more than 25% of the original Contract Sum. Any Change Order, Construction Change Directive, or other Change in the Work that would exceed that limit is void and of no effect.

§ 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 In no event shall a single change, or the aggregate of all changes, result in the total costs, reimbursements and fees exceeding the Contract Sum or be the basis of a change in the Contract Time unless and until such change has been authorized by a Change Order executed and issued by the Owner in accordance with the Contract Documents prior to the commencement of such modified or changed Work. Changes in the Work may be made without notice to Contractor's sureties and absence of such notice shall not relieve such sureties of any of their obligations to Owner.

§7.2.3 Contractor stipulates that acceptance of a Change Order by the Contractor shall constitute full accord and satisfaction for any and all Claims, whether direct or indirect, including but not limited to, impact or delay damages, arising from the subject matter of the Change Order and attorney's fees and costs arising from a dispute with a Subcontractor or Sub-subcontractor over the Change Order.

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§ 7.2.4 Methods used in determining adjustments to the Contract Sum may include those listed in Section 7.3.3.

§ 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, if required by the Owner, the 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 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 (additional mark-ups for overhead, profit and fees will not be allowed);
- **.3** Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee subject to the limitations of Section 7.1; or
- **.4** As provided in Section 7.3.4 subject to the limitations of Section 7.1.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall make a recommendation of the amount by which the Contractor's direct costs have actually been increased over the direct cost of performing the Work without the Change in the Work. all subject to the approval of the Owner. The Contractor shall keep and present, in such form as the Architect or Owner 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** Actual 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** Actual costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;
- **.3** Actual rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others at rates that are no greater than market rates in the locale of the Work at the time of the Work. Unless otherwise established in the Contract, the rental value of the Contractor's own equipment shall not be more than the normal local rental rate for similar equipment;;
- **.4** Actual costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change Work, except that sales, use or similar taxes to which the Owner is exempt shall not be included in the calculation of costs; and
- **.5** Actual additional costs of supervision and field office personnel directly attributable to the change only if the adjustment causes an extension of the Contract Time.

§ 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 regardless of the Contractor's agreement with or disagreement with the adjustment in the Contract Sum or Contract Time or the method for determining them, and shall promptly 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 plus the Contractor's allocated percent of profit and

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overhead as confirmed by the Architect. When both additions and credits 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, which shall be further subject to the Owner's review, modification, approval, or rejection. The Architect's interim determination of cost, as modified and/or approved by the Owner, shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of the Contractor 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, subject to Owner approval, 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, Allowances, Contingencies or Contract Time, the Contractor shall notify the Architect in writing 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, Allowances, Contingencies or Contract Time and written instruction from the Architect to proceed, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time. The Owner shall also retain authority to order such minor changes in the Work. The Contractor shall carry out such written orders promptly. Minor changes in the Work shall not include changes that involve the outward appearance of the structure, color schemes, floor plans, building materials, landscaping, or mechanical equipment.

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 and approved by the Owner in accordance with Section 9.8. The date of Final Completion is the date certified by the Architect and Owner in accordance with Section 9.10. Unless otherwise agreed in writing by the Owner, the Contractor agrees that Final Completion shall occur by the date set forth in the Agreement, or by such dates thereafter as may be established in any written extensions granted under Article 8 of the General Conditions.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor stipulates 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's approval of such insurance.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

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§ 8.2.4 The Contractor is subject to liquidated damages, as specified in the Agreement, if the Work is not completed by the date of Substantial Completion and/or the date of Final Completion.

§ 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 (1) an act or neglect of the Owner or Architect, of an authorized employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by fire, governmental actions, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's reasonable control which do not arise through the action or inaction of Contractor or its Subcontractor, Sub-subcontractor or suppliers, could not have been reasonably anticipated, and could not have been avoided through the exercise of reasonable care or prudent construction management by the Contractor; (4) by delay authorized in writing by the Owner; or (5) by other causes that the Contractor asserts, and the Architect and Owner determine, justify delay, then the Contract Time may be extended in writing for such reasonable time as the Architect and Owner may determine. The foregoing notwithstanding, the Contractor shall not be entitled to an extension of time for changes in the Work required due to Contractor fault, or which extend beyond the time extension provided in a Change Order. Nothing in this provision will limit the rights of Owner under other provisions of this Contract. Any provision of the Contract Documents to the contrary notwithstanding, it is expressly agreed that the extension of the Contract Time shall be Contractor's sole remedy for any delay unless the same shall have been caused by acts constituting intentional interference by the Owner which materially interfere with Contractor's performance of the Work, and then only to the extent that such acts continue after Contractor's reasonable prior written notice to Owner of such interference.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15. A disagreement concerning time extensions shall not relieve the Contractor from performing the Work required by the Contract Documents and shall not be cause for the Contractor to suspend Work on the Project.

§ 8.3.3 The Contract does not permit the recovery of damages, including, without limitation, extended home office overhead expenses, general conditions or other consequential damages, by the Contractor for delay or disruption or for extensions of time due to bad weather, acts of God, supply chain issues, or market escalation. Contractor agrees that Contractor shall be fully compensated for all delays solely by an extension of time. Owner's exercise of any of its rights under the Contract Documents, including without limitation, its rights under Article 7, Changes in the Work, regardless of the extent or number of such changes or Owner's exercise of any of its remedies of suspension of the Work or requirement of correction or re-execution of any defective Work, shall not, under any circumstances, be construed as interference with Contractor's performance of the Work and shall not entitle the Contractor to any additional compensation.

§ 8.3.4 In the event of inexcusable delay by Contractor, Owner may direct that the Work be accelerated by means of overtime, additional crews or additional shifts or re-sequencing of the Work. All such acceleration shall be at no cost to Owner.

§ 8.3.5 In the event that Contractor does not complete the Work within the Contract Time, then in addition to any other costs and damages (liquidated or otherwise) for which Contractor is responsible, Contractor will provide, at its expense, any bonds required by governmental authorities to enable Owner to secure a Certificate of Occupancy (if required) even though there are items of Work which are incomplete.

§ 8.3.6 The Contractor's claims related to time shall be made in accordance with applicable provisions of the Contract Documents, or they shall be deemed waived.

§ 8.3.7 Any provision of the Contract Documents to the contrary notwithstanding, it is expressly agreed that the extension of the Contract Time shall be Contractor's sole remedy for any delay unless the same shall have been caused by acts constituting interference by the Owner which interfere with Contractor's performance of the work, and then only to the extent that such acts continue after Contractor's written notice to Owner of such interference. Owner's exercise of any of its rights under the Contract Documents or Owner's exercise of any of its remedies of suspension of the Work or requirement or correction or re-execution of any defective Work shall not, under any circumstances, be construed as interference with Contractor's performance of the Work.

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§ 8.3.8 Concurrent Delays. For purposes of the calculations provided for in this Paragraph 8.3.8, the words "concurrent delay", "concurrently delay" or "occur concurrently" mean the portion of two or more Delays affecting the critical path to Substantial Completion that are overlapping or co-existent. Contractor's right to a Contract Adjustment of the Contract Time (pursuant to Subparagraphs 8.3.8.1, 8.3.8.2 and 8.3.8.3, below) and Contract Price (pursuant to Subparagraphs 8.3.8.4, 8.3.8.5 and 8.3.8.6, below) shall, in the case of concurrent delays, be calculated in accordance with the following:

§ 8.3.8.1 If an Excusable Delay and a Compensable Delay occur concurrently, the maximum extension of the Contract Time shall be the number of Days from the commencement of the first Delay to the cessation of the Delay which ends last.

§ 8.3.8.2 If an Unexcused Delay occurs concurrently with either an Excusable Delay or a Compensable Delay, the maximum extension of the Contract Time shall be the number of Days, if any, by which such Excusable Delay or Compensable Delay exceeds the number of Days of such Unexcused Delay.

§ 8.3.8.3 If an Unexcused Delay occurs concurrently with both an Excusable Delay and a Compensable Delay, the maximum extension of the Contract Time shall be the number of Days, if any, by which such Excusable Delay and Compensable Delay, as determined pursuant to Subparagraph 8.3.8.1, above, exceeds the number of Days of such Unexcused Delay.

§ 8.3.8.4 If an Unexcused Delay occurs concurrently with a Compensable Delay, the maximum period of time for which Contractor shall be entitled to a Change Order to the Contract Price in accordance with the Agreement shall be the number of Days, if any, by which such Compensable Delay exceeds the number of Days of such Unexcused Delay.

§ 8.3.8.5 If a Compensable Delay occurs concurrently with an Excusable Delay, the maximum period of time for which Contractor shall be entitled to a Change Order to the Contract Price in accordance with the Agreement shall be the number of Days, if any, by which such Compensable Delay exceeds the number of Days of such Excusable Delay.

§ 8.3.8.6 If an Unexcused Delay occurs concurrently with both an Excusable Delay and a Compensable Delay, the maximum period of time for which Contractor shall be entitled to a Change Order to the Contract Price in accordance with the Agreement shall be the number of Days, if any, by which such Compensable Delay exceeds the number of Days of such Unexcused Delay.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum, or if the Project is a Construction Manager at Risk Project, Guaranteed Maximum Price, 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.

§ 9.1.2 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 may, by mutual written agreement, be equitably adjusted.

§ 9.1.3 Notwithstanding anything to the contrary contained in the Contract Documents, the Owner may withhold any payment to the Contractor hereunder if and for so long as the Contractor fails to perform any of its material obligations hereunder or otherwise is in default under any of the provisions of the Contract Documents, subject to the requirements of applicable law.

§ 9.2 Schedule of Values

§ 9.2.1 Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a Schedule of Values to the Architect and the Owner before the first Application for Payment, or in the case of a Guaranteed Maximum Price, within 15 days after establishing the Guaranteed Maximum Price, allocating the entire Contract Sum to the various portions of the Work, minimally separating the entire Contract Sum into categories matching the sections of the Project Manual. The Schedule of Values shall be prepared in the form, and supported

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by the data to substantiate its accuracy, required by the Architect and the Owner. This Schedule, unless objected to by the Architect or Owner, 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 or Owner, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment. The Schedule of Values shall be prepared in such a manner that each major item of Work, whether done by Contractor's own forces or subcontracted, is shown as a single line item on AIA Documents G702 and G703, Application and Certificate for Payment. If the Contractor is a Construction Manager at Risk, then the Contractor's fee and general conditions shall be specifically shown, and AIA Documents G732 and G703 shall be used.

§ 9.2.2 In order to facilitate the review of Applications for Payment, the Schedule of Values shall be submitted on AIA Documents G702 and G703 (or G732 and G703, as applicable), and shall include the following:

.1 Contractor's cost for Contractor's fee (if applicable) bonds and insurance, mobilization, general conditions, etc. shall be listed as individual line items.

.2 Contractor's costs for various construction items shall be detailed, generally categorized by specification section, and further by type of application. For example, concrete work shall be subdivided into footings, grade beams, floor slabs, paving, etc.

.3 On major subcontracts, such as mechanical, electrical and plumbing, the schedule shall indicate line items and amounts in detail (for example: underground, major equipment, fixtures, installation fixtures, start-up, etc.).

.4 Costs for subcontract work shall be listed without any additional mark-up of Contractor's costs for overhead, profit or supervision.

.5 If payment for stored materials is requested prior to installation, then material and labor shall be listed as separate line items.

.6 Contractor shall provide a report of actual versus projected reimbursable expenses (general conditions), updated monthly.

§ 9.3 Applications for Payment

§ 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, Sub subcontractors, and suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 Contractor agrees that, for purposes of Texas Government Code Sections 2251.021 and 2251.042, receipt of the Application for Payment by the Architect shall not be construed as receipt of an invoice by the Owner. Contractor further agrees that Owner's receipt of the Certificate for Payment from the Architect shall be construed as receipt of an invoice by the Owner, for purposes of Texas Government Code Sections 2251.021 and 2251.042.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor has not been invoiced by a Subcontractor, Sub-subcontractor, or supplier, unless Contractor has self-performed the Work.

§ 9.3.1.3 Until Final Completion of the Work, the Owner shall withhold retainage as provided in the Contract Documents, except that Owner shall not pay amounts for which the Architect refuses to certify payment, or the Owner refuses to pay, as provided herein in Section 9.4.3 or 9.5. The retainage shall be paid with the Final Payment.

§ 9.3.1.4 All progress payment requests shall be accompanied by (i) an itemization of all Subcontractors, Sub subcontractors, and material suppliers, the amounts due each and the amounts to be paid out of said progress payment to each of them and (ii) by unconditional lien waivers releasing all liens and lien rights with respect to Work for which Owner has made payment under a prior progress payment request in a form reasonably satisfactory to Owner from Contractor and all its subcontractors and material suppliers with contracts in excess of $25,000.00 (Evidence of prior progress payment shall apply to progress payments 61-days or older). When Contractor submits its request for payment of retainage, Contractor shall submit "All Bills Paid" affidavits and unconditional final lien waivers fully releasing all liens and lien rights with respect to the Work in a form reasonably satisfactory to Owner from Contractor and all its Subcontractors, Sub subcontractors, and material suppliers with contracts in excess of

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$25,000.00. Applications for Payment shall be certified as correct by Contractor. When requested by Owner or when required by the Davis-Bacon Act, each Application for Payment shall also be accompanied by Certified Payrolls and such other affidavits, certificates, information, data and schedules as Owner may reasonably require. The Owner is not required to make any payment to Contractor to the extent reasonably necessary to protect Owner. In addition to the other requirements of this Article, the initial Application for Payment shall be proceeded or accompanied by the following:

1. List of subcontractors,
2. Schedule of values,
3. Contractor's construction schedule (preliminary if not final),
4. If applicable, Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor,
5. Products list (preliminary if not final),
6. Schedule of unit prices,
7. Submittal schedule (preliminary if not final),
8. List of Contractor's staff assignments,
9. List of Contractor's principal consultants,
10. Copies of building permits,
11. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work,
12. Initial progress report,
13. Report of preconstruction conference,
14. Certificates of insurance and insurance policies,
15. Performance and payment bonds,
16. Data needed to acquire Owner's insurance, and
17. Initial settlement survey and damage report if required

In addition to the other requirements of this Article, each subsequent Application for Payment shall be accompanied by:

1. Updated Microsoft Project schedule meeting the requirements of Section 3.10,
2. Log of Adverse Weather Days, and Instructional Days, including backup documentation,
3. Where Unit Costs are in use, measurements for payments will be made only for actual measured and/or computed length, area, solid contents, number, and weight, unless other provisions are made in the Contract Documents. Payment on a unit price basis will not be made for Work outside finished dimensions shown in the Contract Documents. Include costs for waste, overages and tolerances in the unit price for that line item, and
4. Measurements for unit price quantities will be verified by the Architect/Engineer in conjunction with the General Contractor via inspection of the Work prior to submittal of interim Applications for Payment

§ 9.3.2 Payments will be made on the basis of invoices for specific materials or equipment incorporated in the Work and specific materials or equipment (1) suitably stored at the site or (2) 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 The Contractor's Surety must agree, in writing, to the amounts included in each Application for Payment.
.4 The Contractor must bear the cost of the Owner's and Architect's expenses related to visiting the off-site storage area and reviewing the stored contents. Contractor acknowledges that Architect's time is an additional service and shall compensate Architect directly for same.
.5 Payment shall not include any charges for overhead or profit on stored materials.
.6 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 naming the specific materials or equipment stored and their location) 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

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until the materials or equipment are delivered to Owner's site. Failure to follow these procedures shall result in nonpayment for storage of or insurance on stored materials and equipment. Failure to follow these procedures shall also result in nonpayment of materials and equipment until said materials and equipment are incorporated into the Work.

§ 9.3.3 The Contractor warrants that title to all Work, materials, and equipment covered by an Application for Payment will irrevocably pass to the Owner no later than the time of Owner's payment to Contractor of the invoiced cost. Such title shall be free and clear of all liens, claims, security interests or encumbrances. No Work, material or equipment covered by an Application for Payment shall be subject to an agreement under which an interest is retained or an encumbrance is attached by the seller, the Contractor, or other party. The Contractor further warrants that, upon submittal of an Application for Payment, all Work, materials, and equipment 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, Sub-subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work. CONTRACTOR SHALL DEFEND, INDEMNIFY AND HOLD OWNER HARMLESS FROM AND AGAINST ANY LIENS, CLAIMS, SECURITY INTERESTS OR ENCUMBRANCES FILED BY THE CONTRACTOR, SUBCONTRACTORS, OR ANYONE CLAIMING BY, THROUGH OR UNDER THE CONTRACTOR OR SUBCONTRACTOR FOR WORK, MATERIALS, EQUPMENT, OR OTHER ITEMS COVERED BY PAYMENTS MADE BY THE OWNER TO CONTRACTOR.

§ 9.3.4 Contractor shall submit monthly Applications for Payment electronically, or, if requested by Owner, in writing, to both the Architect and Program Manager, if applicable, in quadruplicate using AIA Documents G702 and G703 Application and Certificate of Payment (or G732 and G703, if applicable) and Continuation Sheet. All blanks in the form must be completed and signatures of Contractor and Notary Public must be original on each form. The Architect and Program Manager, if applicable, may require any additional information deemed necessary and appropriate to substantiate the Application for Payment. Materials that are verified to be on the jobsite or other approved location for use in the Project may also be incorporated into the Application for Payment. Incomplete or inaccurate Applications for Payment shall be returned to the Contractor by the Architect for completion and/or correction. Owner shall have no responsibility for payment of same if the Application for Payment is incomplete or inaccurate.

§ 9.3.5 By signing each Application for Payment, the Contractor stipulates and certifies to the following: that the information presented is true, correct, accurate and complete; that the Contractor has made the necessary detailed examinations, audits and arithmetic verifications; that the submitted Work has been completed to the extent represented in the Applications for Payment; that the materials, equipment, and supplies identified in the Applications for Payment have been purchased, paid for and received; that the Subcontractors, Sub-subcontractors, and suppliers have been paid as identified in the Applications for Payment or that Contractor has been invoiced for same; that Contractor has made the necessary on-site inspections to confirm the accuracy of the Applications for Payment; that there are no known mechanics' or materialmens' liens outstanding at the date of this requisition; all due and payable bills with respect to the Work have been paid to date or are included in the amount requested in the current application; that, except for such bills not paid but so included, there is no known basis for the filing of any mechanics' or materialmen's' liens on the Work; that the Payment Application includes only Work self-performed by Contractor or for which Contractor has been invoiced; and that releases from all Subcontractors, Sub-subcontractors, suppliers, and materialmen have been obtained in such form as to constitute an effective release of lien under the laws of the State of Texas covering all Work performed and for which payment has been made by the Owner to the Contractor. Contractor understands that documents submitted to Owner become government documents under the laws of the State of Texas. Contractor further understands that falsification of Contractor's Application for Payment may constitute a violation of the penal laws of the State of Texas, including, but not limited to, Texas Penal Code Sections 32.46, 37.09, and 37.10, and may justify termination of Contractor's Contract with Owner.

§ 9.3.6 Contractor's request for payment of the retainage may be made only upon expiration of thirty (30) calendar days after Final Completion. The request shall be accompanied by the Contractor's Affidavit of Payment of Debts and Claims or a comparable affidavit on a form acceptable to Owner. This document must be executed under oath and notarized. Per Tex. Gov't Code Section 2252.032(f), on application to Owner for final payment and release of retainage, Owner may withhold retainage if there is a bona fide dispute between Owner and the Contractor and the reason for the dispute is that labor, services, or materials provided by the Contractor, or by a person under the

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direction or control of the Contractor, failed to comply with the express terms of the Contract or if the surety on any outstanding surety bond executed for the Contract does not agree to the release of retainage. Owner shall provide to Contractor written notice of the basis on which Owner is withholding retainage under this section.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect and Program Manager, if applicable, will, within seven (7) days after receipt of the Contractor's Application for Payment, either (1) certify, sign and 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) certify, sign and issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner in writing with a detailed statement of the Architect's reasons for withholding certification and disputing in part certification in accordance with Texas Government Code Section 2251.042(a) and as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner in writing with a detailed statement of the Architect's reason for withholding certification in whole in accordance with Texas Government Code Section 2251.042(a) and as provided in Section 9.5.1; or (4) return the Payment Application to the Contractor as provided in Section 9.3.4. Architect's written reason(s) for withholding certification shall be submitted in accordance with, and construed as, the notice required by Texas Government Code Section 2251.042 *et seq*. The Owner shall have the right to reject, modify, or approve the Architect's Certificate for Payment in whole or in part, and shall have the right to make the final determination of the payment to be made to the Contractor. The Owner shall pay the undisputed amounts certified by the Architect and Program Manager, if applicable, to the Contractor within forty-five (45) days of receipt of the Certificate for Payment from the Architect and Program Manager, if applicable, unless otherwise provided in the Contract Documents. Undisputed amounts unpaid after the date on which payment is due shall bear interest pursuant to Texas Government Code Section 2251.025.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed in writing to the Owner by the Architect. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors, Sub subcontractors, and suppliers and other data unless 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. Such examinations, audits, and verifications, if required by the Owner, will be performed by the Owner's auditors, accountants or other representatives acting in the sole interest of the Owner. By submitting the Contractor's Applications for Payment, the Contractor is certifying that the information presented is true, correct, accurate and complete; that he has made the necessary detailed examinations, audits and arithmetic verifications; that the submitted Work has been completed to the extent represented in the Applications for Payment; that the materials and supplies identified in the previous Applications for Payment have been purchased, paid for and received; that the subcontractors have been paid as identified in the previous Applications for Payment; and that he has made the necessary on-site inspections to confirm the accuracy of the Applications for Payment; that there are no known mechanic's or material men's liens outstanding at the date of requisition; that all due and payable bills with respect to the Work have been paid to date or are included in the amount requested in the current application; that except for such bills not paid but so included, there is no known basis for the filing of mechanic's or material men's liens; and that releases from all subcontractors and material men have been obtained in such form as to constitute an effective release of lien under the laws of the State of Texas causing all Work performed and for which payment has been made by the Owner to the Contractor. In certifying the Contractor's Applications for Payment, the Architect represents that he has observed the progress of the Work, critically evaluated, reviewed and certified that the amounts requested are valid and correct. The issuance of a certificate for payment shall not be a representation by the Architect that the Architect has made exhaustive or continuous on-site inspections or that the Architect has made examinations to ascertain how or for what purposes the Contractor has used amounts previously paid on account of the Contract. Such examinations, audits and verifications, if required by the Owner, will be performed by the Owner's accountants or other representatives of the Owner acting in the sole interest of the Owner. The Contractor acknowledges that the Owner may authorize minor changes to the work and that those minor changes may be funded in full or in part from contingencies or allowances

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which are represented in Applications for Payment and supporting documents. The Owner will rely upon the accuracy of the Application for Payment and supporting documentation furnished by the Contractor in authorizing minor changes and expenditures against Allowances. Therefore, the Contractor agrees that any arithmetic error made by the Contractor in any Application for Payment and supporting documents such as contingency logs or allowance balances shall not create an obligation on the part of the Owner to pay additional sums to correct previously approved Applications for Payment. **CONTRACTOR SHALL INDEMNIFY AND HOLD OWNER HARMLESS FROM ANY LIENS, CLAIMS, SECURITY INTERESTS OR ENCUMBRANCES FILED BY THE CONTRACTOR, SUBCONTRACTORS, OR ANYONE CLAIMING BY, THROUGH OR UNDER THE CONTRACTOR OR SUBCONTRACTOR FOR ITEMS COVERED BY PAYMENTS MADE BY THE OWNER TO CONTRACTOR.**

§ 9.4.3 The issuance of a Certificate for Payment shall constitute a recommendation to the Owner regarding the amount to be paid and shall be a prerequisite to any payment being made by the Owner to the Contractor. The Certificate of Payment is not binding on the Owner, and the Owner may rely on other provisions of the Contract Documents, as well as the Architect's Certificate, and on other information known to the Owner to determine the amount to be paid to or withheld from the Contractor.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect 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 opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect 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 in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including, but not limited to, loss resulting from acts and omissions described in Section 3.3.2, because of

- **.1** defective Work not remedied;
- **.2** third party claims filed 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, Sub subcontractors, or suppliers 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 a Separate Contractor;
- **.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** failure to carry out the Work in accordance with the Contract Documents;
- **.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; or
- **.9** failure to provide any submittals or documentation required under the Contract Documents in a timely manner, including a schedule of values and a construction schedule.

§ 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 Notwithstanding any provision contained within this Article, if the Work has not attained Substantial Completion or Final Completion by the required dates, subject to extensions of time allowed under these General Conditions, then Architect may withhold any further Certificate for Payment to Contractor to the extent necessary to preserve sufficient funds to complete the construction of the Project and to cover liquidated damages. The Owner shall not be deemed to be in breach of the Contract Documents by reason of the withholding of any payment which Owner is entitled to withhold pursuant to any provision of the Contract Documents or withholding in reliance on any such Contract Document provision in good faith, or withholding, in good faith, in reliance on information that has come to the attention of the Owner that Owner reasonably believes constitutes sufficient reason to withhold

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payment, and no interest shall accrue in connection with the withheld payment(s) determined to have been properly withheld.

§ 9.5.5 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.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment for undisputed amounts, the Owner shall review the Application for Payment and the Architect's Certificate and shall make payment or withhold payment in the manner and within the time provided in the Contract Documents, and shall notify Contractor within 21 days if Owner disputes the Architect's Certificate for Payment, pursuant to Texas Government Code Section 2251.042 et seq, listing the specific reasons for nonpayment. Payments to the Contractor shall not be construed as releasing the Contractor or his Surety from any obligations under the Contract Documents.

§ 9.6.2 The Contractor will receive the payments made by Owner and will hold such payments in trust to be applied first to the payment of Subcontractors, Sub-subcontractors, suppliers and any other parties furnishing labor, materials, equipment or services for the Work in accordance with the provisions of their subcontracts. The Contractor shall pay each Subcontractor, Sub-subcontractor, and supplier, no later than seven days after receipt of payment from the Owner and before using any part of the payment from the Owner for any other purpose, the amount to which such party is entitled, reflecting percentages actually retained from payments to the Contractor on account of such party's portion of the Work, and shall, if requested, provide the Owner with evidence of such payment. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner, and if the Owner so requests, shall provide to the Owner copies of such Subcontractor payments. If the Contractor has failed to make payment promptly to the Contractor's Subcontractors, Sub-subcontractor, or for materials or labor used in the Work for which the Owner has made payment to the Contractor, the Owner shall be entitled to withhold payment to the Contractor, in part or in whole, to the extent necessary to protect the Owner. This Section is subject to the provisions of Texas Business and Commerce Code Chapter 56, as applicable to Owner.

§ 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. The Owner shall have the right at all times to contact Subcontractors, Sub subcontractors, and material and equipment suppliers to ascertain whether they have been properly paid. Progress payments may, in the discretion of Owner, be made in the form of checks payable jointly to the Contractor and such parties. In the event Owner receives any notices of non-payment from parties furnishing labor, materials, equipment or services for the Work, progress payments and/or Final Payment may, in the discretion of Owner, be made in the form of checks payable jointly to the Contractor and such parties for such amounts as the Contractor agrees or the Owner determines are due. Notwithstanding any other provision in the Contract Documents, neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor Sub-subcontractor or supplier. Action on the part of the Owner to require Contractor to pay a Subcontractor, Sub-subcontractor, or supplier shall not impose any liability on Owner.

§ 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 The Contractor shall, as a condition precedent to any obligation of the Owner under the Contract, provide to the Owner payment and performance bonds in the full penal amount of the Contract in accordance with the terms and provisions of the Contract Documents, including Article 11 herein, and in accordance with Texas Government

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Code Chapter 2253. Payments received by the Contractor from the Owner for Work properly performed by Subcontractors, Sub subcontractors, or provided by suppliers shall be held in trust by the Contractor for the benefit of those Subcontractors, Sub subcontractors, or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner.

§ 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 may notify the Contractor. The Contractor acknowledges that no lien rights exist with respect to public property.

§ 9.6.9 Contractor shall not withhold as a retainage a greater percentage from Subcontractors or materialmen than the percentage that Owner withheld as retainage from payments to Contractor.

§ 9.7 Failure of Payment

§ 9.7.1 Pursuant to Texas Government Code Section 2251.051, if the Owner does not pay the Contractor any payment certified by the Architect, which is undisputed, due and owing after the date the payment is due under the Contract Documents, then the Contractor may, upon ten (10) additional days' notice to the Owner and Architect that payment has not been made and the Contractor intends to suspend performance for nonpayment, may, subject to applicable law, stop the Work until payment of the undisputed amount owing has been received. If the Owner provides written notice to the Contractor that: 1) payment has been made; or 2) a bona fide dispute for payment exits, listing the specific reasons for nonpayment, then Contractor shall be liable for damages resulting from suspension of the Work. If a reason specified is that labor, services, or materials provided by the Contractor are not provided in compliance with the Contract Documents, then the Contractor shall be provided a reasonable opportunity to cure the noncompliance or to compensate Owner for any failure to cure the noncompliance. No amount shall be added to the Contract Sum as a result of a dispute between Owner and Contractor unless and until such dispute is resolved in Contractor's favor.

§ 9.7.2 If the Architect does not issue a Certificate for Payment within seven (7) days after receipt of the Contractor's Application for Payment, through no fault of the Contractor, then the Contractor shall provide written notice to the Owner, and the Owner shall have fourteen (14) Business Days after receipt of such notice to provide or obtain a Certificate for Payment. If Owner fails to provide or obtain the Certificate for Payment, then the Contractor may, upon fourteen (14) additional Business Days' written notice to the Owner and Architect, stop the Work until payment of the undisputed amount owing has been received.

§ 9.7.3 If the Owner is entitled to reimbursement or payment from the Contractor under or pursuant to the Contract Documents, such payment shall be made promptly upon demand by the Owner. Notwithstanding anything contained in the Contract Documents to the contrary, if the Contractor fails to promptly make any payment due to Owner, pursuant to the Contract, or the Owner incurs any costs or expenses to cure any default of the Contractor or to correct defective Work, then the Owner shall have an absolute right to offset such amount against the Contract Sum and may, in the Owner's sole discretion and without waiving any other remedies, elect either to:

.1 deduct an amount equal to that to which the Owner is entitled from any payment then or thereafter due to Contractor from the Owner; or

.2 issue a written notice to the Contractor reducing the Contract Sum by an amount equal to that to which the Owner is entitled.

§ 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; all Project systems included in the Work or designated portion thereof have been successfully tested and are fully operational; system demonstrations have been performed; and a certificate of occupancy shall have been issued before Substantial Completion can be achieved. The Work will not be considered suitable for Substantial Completion review until all required governmental inspections and certifications required of the Work have been made, approved, and posted; designated initial demonstration and instruction of Owner's personnel in the operation of Project systems has been completed; all final finishes set out within the Contract Documents are in place as required by the Specifications, and there shall have been a completion of and acceptance by Owner of all major punch-list items and a majority of minor items are of a cosmetic nature, so that the Owner

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could occupy or otherwise utilize the Project on that date and the completion of the Work by the Contractor would not materially interfere or hamper the Owner's (or those claiming by, through or under the Owner) normal business operations. All work that could interfere with the Owner's use following Substantial Completion shall be performed by the Contractor after hours at no additional expense to the Owner. As a further condition of Substantial Completion acceptance, the Contractor shall certify that all remaining Work will be completed by the date of Final Completion stated in the Contract Documents. In the event Substantial Completion is not achieved by the designated date, or as it may be extended, Owner may withhold payment of any further sums due until Substantial Completion is achieved. Owner shall also be entitled to deduct out of any sums due to Contractor any or all Liquidated Damages due Owner in accordance with the Contract Documents. In addition to the requirements of the Contract Documents, it is expressly understood that the establishment of Substantial Completion is subject to the following:

1. All fire alarm system components must be completed and demonstrated to the Owner.
2. Local fire marshal approval certificate must be delivered to the Owner.
3. All Project systems included in the Work or designated portion thereof have been successfully tested and are fully operational
4. All HVAC air and water balancing must be complete.
5. All Energy Management Systems must be complete and fully operational and demonstrated to the Owner.
6. All school communications equipment, building security/access control, and telephone systems must be complete and demonstrated to the Owner.
7. All final lockset cores and keys must be installed and labeled with a bitting list.
8. All room plaques, wayfinding signage, and exterior signage must be complete.
9. All Owner demonstrations and training must be completed, including kitchen equipment, HVAC equipment, plumbing equipment, and electrical equipment.
10. All final finishes set out within the Contract Documents are in place as required by the Specifications
11. All exterior clean-up and landscaping must be complete.
12. All final interior clean-up must be complete.
13. A final Certificate of Occupancy and/or Certificate of Completion conforming to the requirements of the location jurisdictional authority must be signed by the Contractor and delivered to the Owner.
14. All operation and maintenance manuals must be submitted to the Architect, approved by the Architect, and delivered to the Owner.
15. Temporary facilities and utility services have been removed.
16. elevation certificate furnished and accepted by all authorities having jurisdiction, including but not limited to the County in which the Project is located.
17. Windstorm (WPI-8) certificate furnished and accepted by all authorities having jurisdiction, including but not limited to the County in which the Project is located if applicable.

§ 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, using the Owner's Project Management Software, prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to Final Payment. The punch list shall contain an area or room description, and a photograph of each deficiency listed in the punch list and a space for contractor and architect to individually indicate the date of the correction and observation of the correction, respectively. 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. The Architect and/or Owner shall have the right to add additional items to be completed or corrected to the comprehensive list submitted by the Contractor.

§ 9.8.2.1 The Contractor's Project Manager or superintendent shall participate in the preparation of the Contractor's punch list that is submitted to the Architect and Owner for supplementation. Upon receipt, the Architect shall perform a spot review to determine the adequacy and completeness of the Contractor's punch list. 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 further inspection and revision. The date of Substantial Completion will be delayed until the punch list submitted is a reasonable representation of the Work to be done.

§ 9.8.2.2 Upon receipt of an acceptable Contractor's punch list, the Contractor's Superintendent or Project Manager shall accompany the Architect, his Consultants and the Owner (at his discretion) during their inspections and the preparation of verbal or written additions to the Contractor's punch list. The Contractor's Project Manager or Superintendent shall record or otherwise take notes of all supplementary items and incorporate into the Final Punch List. A typed addition to the supplements to the punch list will be made by the Contractor. This procedure will

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produce a Final Punch List that has the Contractor's, Architect's, Consultant's and Owner's comments incorporated in only one list using the Owner's Project Management Software. Delay in the preparation of the Final Punch List 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 its consultants and will have been expected to have taken appropriate own notes.

§ 9.8.2.3 The Contractor's Project Manager or Superintendent shall have been in attendance during the inspections of the Architect and his Consultants and will have been expected to take his own notes for addition to the Final Punch List.

§ 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, then the Architect shall so notify the Contractor and Owner in writing, and the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect or Owner. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion. Architect is obligated under the agreement between Owner and Architect to make only a limited number of site visits to determine dates of Substantial Completion. Any fee which Owner incurs for additional site visits of Architect for determination of Substantial Completion will be at the expense of Contractor. Owner will deduct amount of Architect's compensation for re-inspection services from Final Payment or, at the Owner's discretion, may require the Contractor to reimburse the Owner for such costs directly.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare, sign, and issue to Owner 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 Final Punch 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.

§ 9.8.5.1 After the date of Substantial Completion of the Project as evidenced by the Certificate of Substantial Completion, the work to correct all deficiencies contained in the punch list attached to the Certificate of Substantial Completion shall be completed by the date set forth in the Agreement, or by such dates thereafter as may be established in any written extensions granted under Article 8 of the General Conditions. Failure by 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 ninety (90) additional days, the Owner will initiate action to complete corrective work out of the remaining contract funds in accordance with Article 14.2. Additional costs of the Owner, Architect, and other consultants incurred because of the Contractor's failure to complete the correction of deficiencies by the date set forth in the Agreement, or by such dates thereafter as may be established in any written extensions granted under Article 8 of the General Conditions, will be deducted from the funds remaining to be paid to the Contractor. Should corrective work following Substantial Completion require more than one re-inspection after notification by the Contractor that corrections are complete; the cost of subsequent inspections shall also be deducted from funds remaining unpaid to the Contractor.

§ 9.8.5.2 The issuance of a Partial Certificate of Substantial Completion shall not relieve the Contractor from the obligation to obtain Substantial Completion for the portions of the project not included in the Partial Certificate of Substantial Completion by the dates indicated in this Agreement. The issuance of a Partial Certificate of Substantial Completion shall not relieve the Contractor from the assessment of liquidated damages for the portions of the project not included in the Partial Certificate of Substantial Completion by the dates indicated in this Agreement.

§ 9.8.6 Retainage is not due to the Contractor until thirty-one (31) days after Final Completion of the Work as set out in Section 9.10. After the Certificate of Substantial Completion is accepted by the Owner, the Owner may, at its sole discretion and upon acceptance and consent of surety, make payment of retainage on all or a part of the Work

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accepted. Final Completion includes submittal of all required closeout and record documents. The Contractor's request for retainage payment shall be accompanied by the Contractor's Affidavit of Payment of Debts and Claims or a comparable affidavit on a form acceptable to Owner. This document must be executed under oath and notarized.

§ 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, if such consent is necessary, 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 that 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 and Owner 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 or Owner. Contractor agrees that the Owner may place and install as much equipment and furnishings as is possible before completion or partial completion of portions of the Work.

§ 9.9.2 Immediately prior to such partial occupancy, use, or installation, 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 in writing, partial occupancy or use of a portion or portions of the Work or installation of furnishings and equipment shall not constitute acceptance of Work not complying with the requirements of the Contract Documents nor shall it constitute evidence of Substantial Completion or Final Completion.

§ 9.9.4 In the event that Owner takes partial occupancy or installs furnishings and equipment prior to Substantial Completion of the Project, Contractor shall obtain an endorsement to Contractor's Builder's Risk Policy to provide extended coverage for partial occupancy if the Contractor's Builder's Risk Coverage required by Article 11 would not otherwise provide such coverage.

§ 9.9.5 Non-Triggering of Substantial Completion by Owner Occupancy: The parties expressly acknowledge and agree that any occupancy or use of the Project, or any portion thereof, by the Owner prior to formal acknowledgment of Substantial Completion as defined in the Contract Documents does not constitute or imply the attainment of Substantial Completion. Any necessity or decision by the Owner to occupy the Project, or any portion thereof, prior to the Contractor's full completion of all contractual obligations does not accelerate or alter the Contractor's duties or the standards for Substantial Completion. The Contractor remains fully obligated to achieve Substantial Completion according to the terms set forth in the Contract Documents, irrespective of any such early occupancy or use by the Owner. The Owner's occupancy, whether full or partial, will not trigger or cause Substantial Completion or affect any rights or obligations that arise upon Substantial Completion, including but not limited to, commencement of any warranties or guarantees, or the period for final completion.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 When all of the Work is finally completed and all required documentation has been submitted, and the Contractor is ready for a final inspection, it shall notify the Owner and the Architect thereof in writing. Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Contractor shall issue its final Application for Payment. Upon the Architect's agreement and approval, the Architect will promptly prepare, sign, and issue a Owner's Certificate of Final Completion and final Certificate for Payment certifying to the Owner that best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance, including all retainage, found to be due the Contractor and noted in the final Certificate is due and payable. The Architect'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. Owner may rely on other provisions of the Contract

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Documents, as well as the Architect's certifications, in determining the payment to be made to Contractor. Final Payment shall be made by the Owner in accordance with Owner's regular schedule for payments. The Architect is obligated under the agreement between Owner and Architect to make only a limited number of site visits to determine Final Completion. Any fee which Owner incurs for additional site visits of Architect for determination of Final Completion will be at the expense of Contractor. Owner will deduct amount of Architect's compensation for re-inspection services from final payment or, at the Owner's discretion, may require the Contractor to reimburse the Owner for such costs directly.

§ 9.10.2 Neither Final Payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) using AIA Document G706, 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) evidence satisfactory to Owner 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) using AIA Document G707, Consent of Surety, if any, to Final Payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) except for amounts currently withheld by the Owner, other data establishing payment or satisfaction of obligations, such as AIA Document G706A, notarized subcontractor lien releases, and other receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract or the Work, to the extent and in such form as may be designated by the Owner. If a Subcontractor, Sub-subcontractor, or supplier 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. In addition, the following items must be completed and received by the Owner before Final Payment will be due:

.1 Written certifications required by Sections 10.5, 10.6, and 10.7.
.2 Final List of Subcontractors (AIA Document G705);
.3 Contractor's certificate(s) required by 19 Tex. Admin. Code 61.1036-61.1040, as applicable;
.4 Contractor's and other required warranties, organized as required elsewhere in the Contract Documents;
.5 Maintenance and Instruction Manuals;
.6 Owner's Final Completion Certificate; and
.7 Record drawings as required elsewhere in the Contract Documents.

Documents identified as affidavits must be notarized. All manuals will contain an index listing the information submitted. The index section will be divided and identified by tabbing each section as listed in the index. Upon request, the Architect will furnish the Contractor with blank copies of the forms listed above. Final Payment shall be paid by the Owner to the Contractor within thirty (30) days after Owner's Board of Trustees has voted to accept the Work and approve Final Payment, unless otherwise delegated.

Owner, Architect, Contractor, and prime subcontractors, if applicable, shall certify compliance with all applicable school facility standards required in 19 TAC Section 61.1040 subsections (d) and (g)-(k). 19 TAC Section 61.1040(f).

Per 19 TAC Section 61.1040(6)(f)(C), Contractor shall certify the following:

(i) Process certifications. To ensure construction quality and performance of contract terms, the Contractor and prime subcontractors, if applicable, shall certify compliance that the Project has been built in conformance with the contract documents.

(ii) Certifications related to construction quality standards under subsection (j) of 19 TAC Section 61.1040.

To ensure compliance with construction quality standards, the Contractor and prime subcontractors, if applicable, shall certify compliance at the completion of a capital improvement project that the Project has been built in conformance with the contract terms and performance standards specified by the Contract Documents for the Contractor and for any of its subcontractors or subconsultants of any tier, which shall include certification of compliance with any subsequent change order documents approved by the Owner and Architect.

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Where a third-party code compliance officer is required by subsection (j) of 19 TAC Section 61.1040 to ensure that a third-party code compliance officer does not find any violations of the provisions of the required construction codes identified in subsection (j)(1) of 19 TAC Section 61.1040 that are not enforced by a state or local authority having jurisdiction, Owner shall require that a third-party code compliance officer issue a third-party certificate of occupancy. Where a local authority having jurisdiction enforces some of the required construction codes, a third-party code compliance officer shall not issue a third-party certificate of occupancy until either the local authority having jurisdiction has issued a certificate of occupancy or the local authority having jurisdiction indicates in writing to the third-party code compliance officer that the local authority having jurisdiction does not issue certificates of occupancy.

Certifications related to safety and security standards under subsection (k) of 19 TAC Section 61.1040. To provide a safe and secure environment, the Contractor and prime subcontractors, if applicable, shall certify compliance that the Project has been built in reasonable accordance with the safety and security directives provided by the school district and reflected in the Contract Documents prepared by the Architect.

Special provisions for a Construction Manager-Agent. For projects that use the construction manager agent contracting method established in Texas Government Code Chapter 2269, Subchapter E, the Construction Manager Agent and each construction prime contractor must provide certification in accordance with clause (i) of 19 TAC Section 61.1040, and each shall certify the scope of work for which they are contractually responsible.

§ 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, if necessary, written consent of the surety, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted, less retainage. 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 by Owner. Nothing in this subsection is intended to limit or reduce Owner's rights and remedies in the event of a Contractor default.

§ 9.10.4 The making of Final Payment shall not constitute a waiver of Claims by the Owner.

§ 9.10.5 Acceptance of Final Payment by the Contractor, a Subcontractor, Sub-subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously asserted pursuant to Article 15 made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

§ 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 Contractors 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 performance of its obligations under Article 10 shall not relieve any Subcontractor, Sub-subcontractor, supplier, or any other person or entity, of their responsibilities for the safety of persons and property and for compliance with all applicable federal, state and local laws, rules, regulations, and ordinances, nor shall any such party be relieved from 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, Sub-subcontractors, suppliers or 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, possess, distribute, or sell alcoholic beverages while on Owner's premises. No person shall use, possess, distribute, or sell

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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 adopted or will adopt its own policy 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, Sub-subcontractors, suppliers, 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 incident 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 for-cause alcohol or drug test.

§ 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, school personnel, students, and other persons on or off Owner's premises who may be affected thereby, including the installation of fencing between the Work site and the occupied portion of a connecting or adjacent educational or other facility;

.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, a Sub-subcontractor, or a supplier; and

.3 other property at the site or adjacent thereto, such as other buildings and their contents, fencing, trees, shrubs, lawns, walks, athletic fields, facilities and tracks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

The Contractor shall also do all things necessary to protect the Owner's premises and all persons from damage and injury, when all or a portion of the Work is suspended for any reason. Contractor's obligations under Section 10.2 as to each portion of the Project shall continue until Owner takes full possession of and occupies that portion of the Project.

§ 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. The Contractor shall promptly report in writing to the Owner and Architect all accidents arising out of or in connection with the Work which cause death, bodily injury, or property damage, giving full details and statements of any witnesses. In addition, if death, serious bodily injuries, or serious property damages are caused, the accident shall be reported immediately by telephone or messenger to the Owner and the Architect.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including installing fencing, posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards. 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 or 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 or storage of explosives or other hazardous materials or 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 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 explosive materials on Owner's property is prohibited unless expressly approved in advance in writing by Owner and Architect.

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§ 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.

§ 10.2.7 The Contractor shall not load or permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 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 or to other portions of the Project. The Contractor shall be responsible for performing all repairs and/or replacement of any Work that results from foreseeable weather conditions, and shall also be responsible for all repairs and/or replacement of any other portions of the Project to the extent such repairs and/or replacement are required as a result of Contractor's failure to properly secure the Work or otherwise take precautions with respect to the Work as required under this Section 10.2.8.

§ 10.2.9 Injury or Damage to Person or Property
If either party to the Contract suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts and omissions 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 twenty-one (21) days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter. Provided, however, Contractor understands that, under Texas law, Owner has tort immunity.

§ 10.2.10 The performance of the foregoing services 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.

§ 10.2.11 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.

§ 10.3 Hazardous Materials and Substances
§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. 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), 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. The Contractor shall have no responsibility to initially discover the presence of such hazardous materials on the project site but shall have an affirmative duty to immediately report to the Owner the existence of such materials actually known by the Contractor or the Contractor's subcontractors to be present on the project site. Provided, however, that these limitations shall not apply if the Contractor places or allows such hazardous materials to be placed on the Project site. If Contractor encounters polychlorinated biphenyl (PCB), and the specifications require the PCB's removal, the Contractor shall remove the PCB and store it in marked containers at the jobsite provided by the Owner. If PCBs are found which are leaking, then Contractor shall stop work on the affected fixture and shall contact Owner for removal and disposal of the leaking PCBs.

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§ 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 within a reasonable time to be determined upon written agreement of the Owner and Contractor. The Contractor may be entitled to an equitable adjustment regarding the Date of Substantial Completion and/or Final Completion to the extent of any delay directly attributable to efforts to remove or safely contain a material or substance as required hereunder. If Contractor is engaged by Owner to remove and/or contain a material or substance as required under Section 10.3, Owner and Contractor shall mutually agree, in writing, on a Change Order to reflect payment for such work.

§ 10.3.3 IF CONTRACTOR IMPORTS HAZARDOUS MATERIALS ONTO THE PROJECT SITE, THEN CONTRACTOR HEREBY AGREES TO DEFEND, INDEMNIFY AND HOLD HARMLESS THE OWNER, ITS CONSULTANTS, TRUSTEES, OFFICERS, AGENTS AND EMPLOYEES, AGAINST ANY CLAIMS ARISING OUT OF OR RELATED TO SUCH IMPORTATION, INCLUDING BUT NOT LIMITED TO COSTS AND EXPENSES THE OWNER INCURS FOR REMEDIATION OF A MATERIAL OR SUBSTANCE THE CONTRACTOR BRINGS TO THE SITE, AS PROVIDED FOR IN SECTION 3.18.

§ 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 actual cost and expense thereby incurred.

§ 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.

§ 10.5 Materials Containing Asbestos, Lead or PCB's

§ 10.5.1 As part of submittals under the section in the Project Manual related to Contract Closeout, and prior to Final Payment and payment of retainage, the Contractor and, as applicable, each Subcontractor, Sub-subcontractor and supplier shall submit all applicable Safety Data Sheets (SDS) and a notarized statement on company or other official letterhead certifying to the best of their information, knowledge and belief, that no lead, asbestos, asbestos-containing (or, under reasonably foreseeable conditions, releasing) materials or PCBs in excess of amounts allowed by Local/State standards, laws, codes, rules and regulations; the Federal Environmental Protection Agency (EPA) standards and/or the Federal Occupational Safety and Health Administration (OSHA) standards, whichever is most restrictive, have been used or incorporated into the Work, and lead or lead-bearing (or, under reasonably foreseeable conditions, releasing) materials have not been incorporated into potable water systems. As used in this statement, the term "potable water systems" shall include, without limitation, those water systems for drinking fountains, all sinks, showers, bathtubs, residential and commercial kitchen equipment, ice machines, and hose bibs, as applicable to the Project. The notarized statement shall further state that, should any such materials be found in any of the Work in contravention of the notarized statement, then Contractor shall be responsible for taking all necessary

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corrective action to remove those materials from the Work, at no additional cost to the Owner. The notarized statement shall be dated, shall reference this specific Project, and shall be signed by not less than two (2) officers of the Contractor or the applicable Subcontractor, Sub-subcontractor, or supplier.

§ 10.5.2 To the best knowledge of the Owner, the Architect and his consultants, no products or materials containing asbestos or polychlorinated biphenyl (PCB) or other toxic substances have been specified for this Project. In the event the Contractor, its Subcontractors, Sub-subcontractors, or suppliers become aware that any products or materials specified, ordered, scheduled for or already incorporated in the Work on this Project, contain any hazardous material, whether stated in the Contract Documents or not, the situation shall be reported immediately to the Owner and Architect in writing. An acceptable, equal substitute for the product or material in question shall be proposed by the Contractor, and the product or material in question, if already onsite or incorporated in the Work, shall be removed from the site immediately and returned to the supplier or manufacturer.

§ 10.5.3 Final Payment and payment of retainage shall not be made until the information and notarized statements required under Section 10.5 have been received by Owner.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 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, its trustees, officers, employees, agents, and representatives, Architect, and Architect's consultants, the Program Manager, if applicable, 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.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Without limiting or waiving Owner's right to earlier notice of any modification, termination, or expiration of insurance coverages as provided in the Contract Documents, immediately upon 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, expiration, or other lapse,. Upon receipt of written 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

§ 11.2.1 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. The Owner shall be responsible for purchasing and maintaining property and casualty insurance no later than the date of Substantial Completion and such dates of Owner responsibility shall be documented in the Certificate of Substantial Completion. If Owner occupies or uses any completed or partially-completed portion of the Work at any stage, then such occupancy or use must be consented to by the insurer and authorized by public authorities having jurisdiction over the Work. To the extent of overlap between Owner's property insurance and Contractor's builder's risk insurance, if any, Contractor's builder's risk shall be primary and non-contributory.

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ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If the Contract Documents specify, or the Architect or Owner requests, that certain Work shall not be covered until the Architect has had an opportunity to examine such Work, the Contractor shall notify the Architect in writing a minimum of 48 hours prior to covering up any such Work in progress in order for the Architect to make proper field observations of the Work in place. The Contractor shall place no concrete, fill-in ditches, or cover up walls or ceilings without first contacting the Architect as noted above and receiving approval. If a portion of the Work is covered contrary to the Architect's or Owner's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect or Owner, 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 and the Contract Documents do not specify otherwise and the Architect or Owner 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 may be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate for the actual cost to uncover and replace such Work. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, and replacement, 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 circumstances, 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.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the entire 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 nonconforming condition. The Owner shall give such notice promptly after discovery of the condition. 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. Nothing contained in this Section 12.2 is intended to limit or modify any obligations under the law or under the Contract Documents, including any warranty obligations, expressed or implied.

§ 12.2.2.1.1 If the Contractor fails to perform the corrective Work, then Owner may perform corrective Work, at Contractor's cost. If Owner performs corrective Work, then Owner may, but is not obligated to, also remove nonconforming Work and store the salvageable materials or equipment at Contractor's expense. If the Contractor does not pay all costs incurred by Owner within ten (10) days after written notice, then Owner may, upon ten (10) additional days' written notice, sell the removed materials and equipment in accordance with Owner's policies, and shall account for the proceeds thereof, after deducting costs and damages that should have been borne by the Contractor, including compensation for the Architect's services and expenses made necessary thereby. If such proceeds of sale do not cover costs which the Contractor should have borne, then the Contractor shall pay the difference to the Owner.

§ 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.

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§ 12.2.2.3 The one-year period for correction of Work shall be extended by corrective Work performed by the Contractor pursuant to this Section 12.2, but only as to that corrected Work.

§ 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.

§ 12.2.6 Contractor shall replace, repair, or restore any parts of the Project or furniture, fixtures, equipment, or other items placed therein (whether by Owner or any other party) that are injured or damaged by any such parts of the Work that do not conform to the requirements of the Contract Documents or by defects in the Work.

§ 12.2.7 The provisions of this Section 12.2 apply to Work done by Subcontractors and Sub-subcontractors of the Contractor as well as Work done directly by employees of the Contractor. The provisions of this Section 12.2 shall not apply to corrective work attributable solely to the acts or omissions of any Separate Contractor of Owner (unless Contractor is acting in such capacities). The cost to Contractor of performing any of its obligations under this Section 12.2 to the extent not covered by insurance shall be borne by Contractor.

§ 12.2.8 If, however, Owner and Contractor deem it inexpedient to require the correction of Work damaged or not done in accordance with the Contract Documents, then an equitable deduction from the Contract Sum shall be made by agreement between Contractor and Owner. Until such agreement, Owner may withhold such sums as Owner deems just and reasonable from moneys, if any, due Contractor. The agreement shall not be unreasonably delayed by the Owner and the amount of money withheld shall be based on estimated actual cost of the correction to Owner.

§ 12.3 Acceptance of Nonconforming Work

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.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the laws of the State of Texas, and any litigation shall be conducted in state district court. Mandatory and exclusive venue for any disputes shall be in Harris County, or, if no county is specified, then the county in which the Owner's main administrative office is located.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to the other party hereto and to partners, successors, assigns and legal representatives of such other party in respect to covenants, agreements, and obligations contained in the Contract Documents. Except as expressly provided otherwise in the Contract Documents, neither party to the Contract shall assign the Contract, in whole or in part, 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 invalidity of any part or provision of the Contract Documents shall not impair or affect in any manner whatsoever the validity, enforceability or effect of the remainder of the Contact Documents.

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§ 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 at appropriate times as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities having jurisdiction. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals, which shall be included in the Cost of the Work. Provided, however, per Texas Government Code Chapter 2269, Owner shall bear all costs of inspection services, the testing of construction materials engineering, and the verification testing services necessary for acceptance of the facility by the Owner 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.

§ 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, but not limited to, 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, with copy to the Owner.

§ 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

Undisputed payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate provided by Texas Government Code Section 2251.025. Any such payment shall be deemed overdue on the thirty-first day after Owner received Architect's invoice or Contractor's Certificate for Payment from the Architect, if Owner's Board of Trustees meets more than once per month. Any such payment shall be deemed overdue on the forty-sixth day after Owner receives Architect's invoice or Contractor's Certificate for Payment from the Architect, if Owner's Board of Trustees meets once a month or less frequently. No interest shall be due on sums properly retained by Owner, except as provided by law, or on disputed sums unpaid by Owner.

§ 13.6 Equal Opportunity in Employment

§ 13.6.1 The Contractor and the Contractor's Subcontractors and Sub-subcontractors shall not discriminate against any employee or applicant for employment in the performance of the Agreement, with respect to hire, tenure, terms, conditions and privileges of employment, or a matter directly or indirectly related to employment, because of race, color, religion, age (except where based on a bona fide occupational qualification), disability, sex except where based

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on a bona fide occupational qualification), national origin, ancestry, or any other basis protected by law. The Contractor agrees to post in conspicuous places, available to employees and applicants, notices setting forth the Contractor's nondiscrimination policies. Contractor further agrees that every subcontract entered into for the performance of the Agreement will contain a provision requiring non-discrimination in employment herein specified. Breach of this covenant may be regarded as a material breach of the Agreement.

§ 13.6.2 The Contractor and the Contractor's Subcontractors and Sub-subcontractors shall, in all solicitations or advertisements for employees placed by them or on their behalf, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, age, disability, sex, national origin, ancestry, or any other basis protected by law.

§ 13.7 Records

§ 13.7.1 Contractor shall at all times through the date of Final Completion, maintain Job Records, including, but not limited to, invoices, payment records, payroll records, daily reports, diaries, logs, instructions, drawings, receipts, subcontracts, purchase orders, vouchers, memoranda, other financial data and job meeting minutes applicable to the Project, in a manner which maintains the integrity of the documents. Job Records must be retained by Contractor for at least twelve (12) years after the date of Final Completion of the Project. Within ten (10) days of Owner's request, Contractor shall make such Job Records available for inspection, copying and auditing by the Owner, Architect or their respective representatives, at Owner's central office.

§ 13.7.2 If Contractor is a Construction Manager at Risk, then Contractor shall also maintain, in accordance with the provisions of Section 13.7.1, the following: subcontract files, including proposals of successful and unsuccessful bidders, bid recaps and subcontractor payments; original estimates; estimating work sheets; general ledger entries detailing cash and trade discounts received; insurance rebates and dividends; and any other supporting evidence deemed necessary by the Owner to substantiate charges related to the Contract.

§ 13.7.3 Contractor shall keep a full and detailed financial accounting system and shall exercise such controls as may be necessary for proper financial management under this Contract; the accounting and control systems shall be satisfactory to the Owner and shall be subject to the provisions of Section 13.7.1.

§ 13.7.4 Contractor shall keep all Construction Documents related to the Project, subject to the provisions of Section 13.7.1, provided, however, Contractor shall not destroy said documents until Contractor has confirmed with Owner in writing that Owner has obtained a copy of all as-built drawings.

§ 13.7.5 In the event that an audit by the Owner reveals any errors/overpayments by the Owner, then the Contractor shall refund to the Owner the full amount of such overpayments within thirty (30) days of such audit findings, or the Owner, at its option, reserves the right to deduct such amounts owed to the Owner from any payments due to the Contractor.

§ 13.8 Proprietary Interests and Confidential Information

§ 13.8.1 Neither Architect nor Contractor shall use the image or likeness of Owner's Project or Owner's official logo or emblem and any other trademark, service mark, or copyrighted or otherwise protected information of Owner, without Owner's prior written consent. Contractor and Architect shall not have any authority to advertise or claim that Owner endorses Architect or Contractor's services, without Owner's prior written consent.

§ 13.8.2 Neither Architect nor Contractor shall disclose any confidential information which comes into the possession of Architect or Contractor at any time during the Project, including but not limited to, the location and deployment of security devices, security access codes, student likenesses, student record information or employee information.

§ 13.8.3 The parties acknowledge that, as a public entity in the State of Texas, Owner is subject to, and must comply with, certain open records laws and other disclosure requirements, including, but not limited to, the Texas Public Information Act, Texas Government Code Chapter 552, et seq., subpoenas, and court orders. Nothing in the Contract shall be construed as prohibiting Owner from disclosing any information related to or in connection with the Contract in accordance with such requirements, and Contractor hereby waives any claim against and releases from liability Owner, its trustees, officers, employees, agents, and attorneys with respect to any such disclosure.

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§ 13.9 The Architect may appoint an employee or other person to assist it during the construction. These representatives will be instructed to assist the Contractor in interpreting the Contract Documents; however, such assistance shall not relieve the Contractor from any responsibility as set forth by the Contract Documents. The fact that the Architect's Representative may have allowed Work not in accordance with the Contract Documents shall not prevent the Architect or the Owner from insisting that the faulty Work be corrected to conform with the Contract Documents and the Contractor shall correct same.

§ 13.10 The Contractor and its employees, agents, consultants, suppliers and subcontractors shall abide by all Owner policies and procedures regarding campus access.

§ 13.11 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 it, nor any of its affiliates, subsidiaries, or its parent company, if any (the "Contractor Companies"), boycott Israel, and Contractor agrees that it and the Contractor Companies will not boycott Israel during the term of the Contract. For purposes of the Contract, the term "boycott" shall mean and include refusing to deal with, terminating business activities with, or otherwise taking any action that is intended to penalize, inflict economic harm on, or limit commercial relations specifically with Israel, or with a person or entity doing business in Israel or in an Israeli-controlled territory, but does not include an action made for ordinary business purposes.

§ 13.12 In accordance with Texas Government Code § 2269.054, the Contract Documents shall not be construed to deny or diminish the right of any person to work because of the person's membership or other relationship status with respect to any organization.

It is expressly understood that this Contract is not written for the benefit of third parties.

§13.12 Certificate of Nonsegregated Facility

§13.12.1 This section is applicable to Contracts and Subcontracts exceeding $10,000.00 that are not exempt from the provisions of the Equal Opportunity Clause.

§13.12.2 By the signing of this Contract, the Contractor signifies that it does not maintain or provide for its employees any segregated facilities at any of its establishments, and that it does not permit its employees to perform their services at any location, under its control, where segregated facilities are maintained. It certifies further that it will not maintain or provide for its employees any segregated facilities at any of its establishments, and that it will not permit its employees to perform their services at any location, under its control, where segregated facilities are maintained. The undersigned agrees that a violation of this certification constitutes a breach of this Contract. As used in this certification, the term "segregated facilities" means any waiting rooms, Work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated on the basis of race, creed, color, or national origin, because of habit, local custom, or otherwise. The Contractor further agrees that (except where it obtained identical certifications from proposed consultants for specific time period) it will obtain identical certifications from proposed Subcontractors prior to the award of a contract exceeding $10,000.00 that are not exempt from the provisions of the Equal Opportunity Clause; that it will retain such certifications in its files; and that it will forward the following notice to such proposed Subcontractors (except where the proposed Subcontractors have submitted identical certifications for specific time periods): Notice to Prospective Subcontractors of requirement for certification of nonsegregated facilities. A certification of nonsegregated facilities, as required by the May 19, 1967 Order (32 FR 7439, May 19, 1967) on elimination of segregated facilities, by the Secretary of Labor, must be submitted prior to the award of a contract exceeding $10,000.00 which is not exempt from the provisions of the Equal Opportunity Clause. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e., quarterly, semiannually, or annually). The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.11.

§ 13.13 In accordance with Texas Business & Commerce Code § 116.0001, as soon as practicable after beginning construction of the project, Contractor shall visibly post the following information at the entrance to the construction site: (1) the name and contact information of the Contractor; and (2) a brief description of the project.

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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 ninety (90) 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 of undisputed sums due on an approved 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, then, after the applicable time period, the Contractor may, upon ten (10) business days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed and for proven unrecoverable loss with respect to materials, equipment, tools, and construction equipment and machinery incurred to the date of termination.

§ 14.1.4 If the Work is stopped for a period of ninety (90) 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 material to the progress of the Work, the Contractor may, upon twenty (20) additional business days' written 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, Sub subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors, Sub subcontractors or suppliers;
- **.3** repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority;
- **.4** otherwise is guilty of substantial breach of a provision of the Contract Documents.
- **.5** fails to furnish the Owner, upon request, with assurances satisfactory to the Owner, evidencing the Contractor's ability to complete the Work in compliance with all the requirements of the Contract Documents;
- **.6** engages in worker misconduct in violation of Article 3.3.2 or engages in conduct that would constitute a violation of state or federal criminal law, including but not limited to, the laws prohibiting certain gifts to public servants, or engages in conduct that would constitute a violation of the Owner's ethics or conflict of interest policies; or
- **.7** fails to proceed continuously and diligently with the construction and completion of the Work, except as permitted under the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and subject to any prior rights of the surety, 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 (7) days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

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.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. Any further payment shall be limited to amounts earned to the date of termination.

§ 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 of the Contract Sum, the Contractor and/or its Surety 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 parties hereby agree that: 1) if an order for relief is entered on behalf of the Contractor, pursuant to Chapter 11 of the U.S. Bankruptcy Code; 2) if any other similar order is entered under any debtor relief laws; 3) if Contractor makes an assignment for the benefit of one or more of its creditors; 4) if a receiver is appointed for the benefit of its creditors; or 5) if a receiver is appointed on account of its insolvency, any such event could impair or frustrate Contractor's performance of the Contract. Accordingly, it is agreed that upon occurrence of any such event, Owner shall be entitled to request of Contractor or its successor in interest adequate assurance of future performance in accordance with the terms and conditions of the Contract Documents. Failure to comply with such request within ten (10) days of delivery of the request shall entitle Owner to terminate the Contract and to the accompanying rights set forth in Subparagraphs 14.2.1 through 14.2.6. In all events, pending receipt of adequate assurance of performance and actual performance in accordance with the Contract Documents, Owner shall be entitled to proceed with the Work with Owner's own forces or with other Contractors on a time and material or other appropriate basis, the cost of which will be charged against the Contract Sum.

§ 14.2.6 As required by Texas Government Code Chapter 2253, if a Performance Bond has been furnished and the Contractor is declared by the Owner to be in default under the Contract, then the Surety shall promptly perform the Work, in full accordance with the plans, specifications and Contract Documents. Unless otherwise agreed in writing between the Surety and the Owner, the Surety shall complete the Work by the Surety entering into a Contract acceptable to Owner, with a contractor acceptable to Owner, and shall obtain new Payment and Performance Bonds as required by law.

§ 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 may, by mutual written agreement, 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 may include profit, upon written agreement of the parties. No adjustment shall be made to the extent
.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

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.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 case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed and for proven unrecoverable loss with respect to materials, equipment, tools, and construction equipment and machinery incurred to the date of termination. Such payment shall not cause the Contract Sum to be exceeded. Such payment shall not include overhead and profit for Work not executed.

§ 14.4.4 Upon determination by a Court of competent jurisdiction that termination of the Contractor pursuant to Section 14.2 was wrongful, such termination will be deemed converted to a termination for convenience pursuant to Section 14.4, and Contractor's remedy for wrongful termination shall be limited to the recovery of the payments permitted for termination for convenience as set forth in Section14.4.

§ 14.5 Termination by the Owner for Non-Appropriation

§ 14.5.1 If the Contract is a multi-year contract funded through Owner's current general funds that are not bond funds, the parties agree that the Contract is a commitment of Owner's current revenue only. As such, notwithstanding any contrary provision of the Contract, any payment obligation(s) of Owner created by the Contract shall be conditioned upon the availability of funds that are duly appropriated and allocated for such purpose. If such funds are not available, as determined by Owner in its sole discretion, Owner shall have the right to terminate the Contract, without default, penalty, or further obligation or liability to Contractor, effective at the end of the period for which such funds are available. In the event this provision is exercised, Owner shall provide written notice of non-appropriation, specifying the effective date of termination, to Contractor as soon as is reasonably practicable.

§ 14.5.2 Upon receipt of notice from the Owner of such termination for non-appropriation, 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.

§ 14.5.3 In case of such termination for non-appropriation, to the extent that funds have been duly appropriated and allocated for such purpose and are available, the Owner shall pay the Contractor for Work properly executed and for proven unrecoverable loss with respect to materials, equipment, tools, and construction equipment and machinery incurred to the date of termination. Such payment shall not cause the Contract Sum to be exceeded. Such payment shall not include overhead and profit for Work not executed.

ARTICLE 15 CLAIMS AND DISPUTES OF CONTRACTOR

§ 15.1 Claims

§ 15.1.1 Definition

General: A Claim is a demand or assertion by the Contractor seeking, as a matter of right, payment of money, interpretation of the Contract terms, a change in the Contract Time, or other relief with respect to the terms of the Contract, the Work, or the Project. The responsibility to substantiate Claims shall rest with the Contractor. 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.

§ 15.1.1.1 Claim for Non-Damages Definition: A demand or assertion by the Contractor seeking, as a matter of contractual right, relief such as an increase in the Contract Time, an increase in the Contract Sum, or other contract-based remedies. A Claim does not automatically include a separate cause of action for damages unless specifically stated otherwise.

§ 15.1.1.2 Claim for Damages Definition: Any portion of a Claim in which the Contractor is seeking monetary damages as a legal remedy (i.e., an actual cause of action under applicable law, such as breach of contract), rather than (or in addition to) a Contract adjustment for time or price or some other relief that does not constitute legal damages.

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§ 15.1.2 Time Limits on Litigation

The Contractor shall commence all litigation against the Owner 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, if any, and within the period specified by applicable law, but in any case not more than 8 years after the date of Substantial Completion of the Work, unless extended in accordance with Texas Civil Practice & Remedies Code Section 16.009. The Contractor waives all claims not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claim for Non-Damages: Claims for Non-Damages by the 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 written notice to the Owner and to the Architect. Claims by the Contractor under this Section 15.1.3.1 shall be initiated within twenty-one (21) calendar days after occurrence of the event giving rise to such Claim or within twenty-one (21) calendar days after the Contractor first knew or should have known of the condition giving rise to the Claim, whichever is earlier. Claims must be initiated by written notice titled "Notice of Claim for Non-Damages" ("Notice") and sent to the Architect and Owner's designated representative. The Notice shall clearly set out the specific matter of complaint, and the impact or damages which may occur or have occurred as a result thereof, to the extent that the impact or damages can be assessed at the time of the Notice. If the impact or damages cannot be assessed as of the date of the Notice then the Notice shall be amended at the earliest date that is reasonably possible. It is imperative that Owner receive timely specific Notice of any potential problem identified by Contractor in order that the problem can be mitigated or resolved promptly.

§ 15.1.3.2 Claim for Damages: Any claim or portion of a claim for damages by the 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 written notice to the Owner and to the Architect. Claims by the Contractor under this Section 15.1.3.2 shall be initiated within ninety-one (91) calendar days after occurrence of the event giving rise to such Claim or within ninety-one (91) calendar days after the Contractor first knew or should have known of the condition giving rise to the Claim for Damages, whichever is earlier. Claims must be initiated by written notice titled "Notice of Claim for Damages" ("Notice") and sent to the Architect and Owner's designated representative. The Notice shall clearly set out the specific matter of complaint, and the impact or damages which may occur or have occurred as a result thereof, to the extent that the impact or damages can be assessed at the time of the Notice. If the impact or damages cannot be assessed as of the date of the Notice then the Notice shall be amended at the earliest date that is reasonably possible. It is imperative that Owner receive timely specific Notice of any potential problem identified by Contractor in order that the problem can be mitigated or resolved promptly. Any claim or portion of a Claim for Damages by the Contractor that has not been made the specific subject of a Notice within ninety-one (91) days after the occurrence of the event giving rise to such claim or within ninety-one (91) days after the Contractor first knew or should have known of the condition giving rise to the Claim, whichever is earlier, shall be waived. Pursuant to Texas Civil Practices and Remedies Code Section 16.071, Contractor agrees that this is a reasonable notice requirement.

§ 15.1.3.2 Claims by 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 Owner. In such event, no decision by the Initial Decision Maker is required. Such Claims are subject to the definitions and notice requirements in § 15.1.1.1, § 15.1.1.2, § 15.1.3.1 and § 15.1.3.2, including the 21-day notice for Claims for Non-Damages and the 91-day notice for Claims for Damages.

§ 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 undisputed payments for Work performed in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time may 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 Or an Increase in the Contract Sum

If the Contractor wishes to make a Claim for additional cost or for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given to Owner and Architect. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4. The Architect will promptly investigate such Claim and report findings and a recommended resolution in writing to the Owner and Contractor. If the Claim is approved by Owner's Board of Trustees, or Owner's representative if otherwise delegated and provided for herein, then Contractor shall proceed with the execution of the Work that is the subject matter of the Claim. If the Claim is rejected by the Owner, then Contractor may pursue alternative dispute resolution or other legal remedies as provided for in the Contract Documents. Under no circumstances shall a claim for additional cost or for an increase in the Contract Sum resulting from supply chain issues or market escalation be approved by Owner.

§ 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, such a Claim shall be documented in accordance with Article 8 and notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of the 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 Claims for increase in the contract time shall set forth in detail the circumstances that form the basis for the Claim, the date upon which each cause of delay began to affect the progress of the Work, the date upon which each cause of delay ceased to affect the progress of the Work and the number of days increase in the Contract Time claimed as a consequence of each such cause of delay. Additionally, any Claim for additional time based on adverse weather conditions 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.

1. Weather data in the table below shall form the baseline for establishing Anticipated Adverse Weather Days per month associated with the Project schedule duration.

Anticipated Adverse Weather Days	
Month	Total of Weather Days Allowed
January	6
February	6
March	5
April	4
May	6
June	7
July	6
August	6
September	6
October	6
November	6
December	6

a. The Anticipated Adverse Weather Days shall be submitted with the Contractor's Construction Schedule for documenting future weather events and is considered to be part of the Project duration forming the Contract Time.

2. When the Project requires work in an occupied building, Instruction Days in the table below shall form the baseline for establishing Instruction Days per month associated with the Project schedule duration.

Anticipated Instruction Days

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Month	Total of Instruction Days Allowed
January	0
February	0
March	0
April	4
May	4
June	0
July	0
August	0
September	0
October	0
November	0
December	0

a. The Anticipated Instruction Days shall be submitted with the Contractor's Construction Schedule for documenting future Instruction Days and is considered to be part of the Project duration forming the Contract Time.

3. Submission for Time Extension

a. Although the Contractor is required to document the occurrence and effect of Adverse Weather or Instruction Days on the Work, it does not relieve the Contractor/Architect of its responsibility to investigate and determine if an excusable delay has occurred.

b. The schedule of Anticipated Adverse Weather Days and Instruction Days included in the Contract is established in Work Days. Similarly, actual weather data should be collected and recorded on a Work Day basis. Monthly summaries should be maintained indicating actual Adverse Weather conditions or Instruction Days and the impact on Work activities.

c. To determine if a given month experienced Adverse Weather Days or Instruction Days, the number of actual Adverse Weather Days or Instruction Days is subtracted from the Anticipated Adverse Weather Days or Anticipated Instruction Days. If the number of Adverse Weather Days or Instruction Days is greater than the Anticipated Adverse Weather Days or Anticipated Instruction Days for a given month, then the Contractor has experienced unusually severe weather or Work disruption for the given month. If the number of Adverse Weather Days or Instruction Days is less than the Anticipated Adverse Weather Days or Anticipated Instruction Days for a given month, then the Net Days shall accumulate to the remaining months and shall be treated as float to the Project. Float time contained in the Contractor's Construction Schedule is not for the exclusive benefit of the Contractor or the Owner, but belongs to the Project and may be consumed by either party as needed on a first-used basis.

d. THE DETERMINATION THAT UNUSUALLY SEVERE WEATHER OR INSTRUCTION DAYS OCCURRED DOES NOT AUTOMATICALLY MEAN THAT THE CONTRACTOR RECEIVES A TIME EXTENSION FOR THE DIFFERENCE OF DAYS BETWEEN THE ANTICIPATED AND ACTUAL ADVERSE WEATHER DELAY OR INSTRUCTION DAYS. Further analysis is necessary to determine if the unusually severe weather or Instructional Days delayed Work activities critical to Contract completion. The Contractor's progress schedule must be evaluated to make this determination. If it is found that unusually severe weather or Instructional Days delayed the Contract, a Contract Modification shall be issued.

e. Claims for increase in the Contract Time shall set forth in writing the detail noting the circumstances that form the basis for the claim, the date upon which each cause of delay began to affect the progress of the Work, the date upon which each cause of delay ceased to affect the progress of the Work and the number of days increase in the Contract Time claimed as a consequence of each such cause of delay. The Contractor shall bear the entire economic risk of all

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weather delays and Instruction Days disruptions and shall not be entitled to any increase in the Contract Price by reason of such delays or disruptions. Requests for an extension of time pursuant to this Subparagraph shall be submitted to the Architect in writing not later than with each Application for Payment and shall include documentation demonstrating the nature and duration of the delays or disruptions. Where appropriate, a revised construction schedule indicating all the activities affected by the circumstances shall be included with the documentation.
f. The parties agree that the reconciliation of the change attributable to Adverse Weather or Instruction Days will occur at the time of Project Final Completion.

§ 15.1.6.3 No extension of time shall be made to the Contractor because of hindrances or delays from any cause which is the fault of Contractor or Contractor's Subcontractors, Sub-subcontractors, or suppliers or otherwise under Contractor's control. Claims for extension of time may only be considered because of Adverse Weather Days, or hindrances or delays which are the fault of Owner and/or under Owner's control, but only to the extent that Substantial Completion of the Project is adjusted beyond the original Substantial Completion date. Claims for extension of time because of hindrances or delays not the fault of either Contractor or Owner shall be considered, but only to the extent that Substantial Completion of the Project exceeds the Substantial Completion date established for the Work. Unless otherwise delegated, Board approval shall be required for any extension of time. Contractor shall only be entitled to time extensions per the terms of the Contract Documents.

§ 15.1.6.4 Notwithstanding any provision herein to the contrary, if the Contractor desires to make a one-time Claim for actual costs directly resulting from permit delays, this Section 15.1.6.4 shall apply. Any Claim for actual costs directly resulting from permit delays ("Permit Delay Days") may only begin accruing ("Commencement Date") following the latter of the following: 1.) when the duration from Notice to Proceed to release of permit exceeds 90 Calendar Days, or 2.) when the anticipated permit release duration stated in the procurement solicitation exceeds 90 Calendar Days. Permit Delay Days cease on the date of permit release ("Release Date").. A Claim under this Section 15.1.6.4 shall be made no sooner than the Release Date and no later than twenty-one (21) calendar days after the Release Date. In making such a one-time Claim for actual costs directly resulting from Permit Delay Days, the Contractor shall be limited to a percentage change rate per day for any claimed actual additional costs, regardless of actual cost to the Contractor or any subcontractor. Claims for Contractor's general conditions will not be allowed. If the Claim is approved, the percentage change rate per day shall be determined as follows: Reference source is the Building Cost Index (BCI) change as reported by Engineering News Record (ENR) at the following link (https://www.enr.com/economics/historical_indices/Dallas). Compute the "benchmark value" by calculating the average BCI for the three (3) months preceding (but not including) the month of the due date of the proposals. Compute the "current value" by calculating the average BCI for the three (3) months preceding (but not including) the month of the Release Date. Divide the current value by the benchmark value, then subtract one; divide the result by the number of elapsed calendar days between Commencement Date and Release Date to determine the daily change limit of any actual costs for Permit Delay Days. Additionally, in making a Claim for additional actual costs under this section, the Contractor agrees that the Owner, Architect, or their respective agents is thereby entitled to review all (related or unrelated to the Claim) bids, proposals, quotes, quantity take-offs, and executed subcontractor agreements for the Project and to contact subcontractors to verify facts pertaining to same. Owner shall be entitled to a credit if the Owner, Architect, or their respective agents' inspection of all bids, proposals, quotes, quantity take-offs, and subcontractor agreements indicate a variance in favor of the Owner. The completion of the Owner's inspection and issuing of a report of the determination of finding relating to a Claim under this section is a precondition to the commencement of time limits for Claims stated in § 15.2. Any Claim under this section 15.1.6.4 shall be subject to the review and approval/rejection procedures outlined in Article 8 and 15.

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor waives all Claims against Owner for consequential damages arising out of or relating to this Contract, including, but not limited to, any amount owed as compensation for the increased cost to perform the Work as a direct result of Owner-caused delays or acceleration.

§ 15.2 Resolution of Claims and Disputes

§ 15.2.1 Claims by the Contractor against the Owner, including those alleging an error or omission by the Architect, shall be referred initially to the Architect for written recommendation. An initial recommendation by the Architect shall be required as a condition precedent to mediation or litigation of all Claims by the Contractor arising prior to

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the date Final Payment is due, unless thirty (30) days have passed after the Claim has been referred to the Architect with no recommendation having been rendered by the Architect.

§ 15.2.2 The Architect will review Claims and within ten (10) days of the receipt of a Claim take one of the following actions: (1) request additional supporting data from the Contractor, or (2) make a written recommendation to the Owner, with a copy to the Contractor.

§ 15.2.3 In evaluating Claims, the Architect 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 Architect in making a written recommendation.

§ 15.2.4 If the Architect requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten (10) days (or in the case of Owner, ten (10) business days) after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Architect when the response or supporting data will be furnished, or (3) advise the Architect that no supporting data will be furnished.

§ 15.2.5 Following receipt of the Architect's written recommendation regarding a Claim, the Owner and Contractor shall attempt to reach agreement as to any adjustment to the Contract Sum and/or Contract Time. If no agreement can be reached, then either party may request mediation of the dispute pursuant to Section 15.3.

§ 15.2.6 Upon receipt of a Claim against the Contractor or at any time thereafter, the Architect or 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 Architect or the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.3 Alternative Dispute Resolution

§ 15.3.1 Any Claim arising out of or related to the Contract, except Claims relating to aesthetic effect and except those waived under the terms of the Contract Documents, may upon mutual written agreement, after written recommendation by the Architect or thirty (30) days after submission of the Claim to the Architect, be subject to mediation at the request of either party. Owner and Contractor expressly agree that mediation shall not be a condition precedent to the initiation of any litigation arising out of such Claim. Claims for injunctive relief shall not be subject to this Section.

§ 15.3.2 The parties may endeavor to resolve their Claims by mediation. A request for mediation shall be made in writing to the other party to the Contract. Mediation shall be subject to and in accordance with Chapter 154 of the Texas Civil Practice & Remedies Code. Mediation shall be conducted by a mutually-agreed-upon mediator. In the event that the parties are unable to agree on a mediator, then the mediation shall be conducted by the Center for Public Policy Dispute Resolution at the University of Texas School of Law.

§ 15.3.3 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the county where the Owner's main administrative office is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be reduced to writing, considered for approval by the Owner's Board of Trustees, signed by the parties if approved by the Board of Trustees, and, if signed, shall thereafter be enforceable as provided by the laws of the State of Texas.

§ 15.3.4 Any claim not resolved in mediation shall be subject to litigation pursuant to Section 13.1.

§ 15.4 No Arbitration

Notwithstanding anything to the contrary in the Contract Documents or in any document forming a part hereof, there shall be no mandatory arbitration for any dispute arising hereunder.

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§ 15.5 Contractor stipulates that Owner is a political subdivision of the State of Texas, and, as such, enjoys immunities from suit and liability provided by the Constitution and laws of the State of Texas. Nothing in the Contract shall be construed as a waiver or relinquishment of any governmental immunities or defenses on behalf of Owner, its trustees, officers, employees, or agents as a result of the execution of the Contract or performance of the functions or obligations described therein.

§ 15.6 In any adjudication under this Agreement, attorneys' fees may be awarded as provided by law.

ARTICLE 16 ADDITIONAL PROVISIONS

§ 16.1 These general conditions incorporate by reference the following documents:
Exhibit A: Wage Rate Determination

OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
« »« »	« »« »
(Printed name and title)	*(Printed name and title)*
(Date)	*(Date)*

DRAFT

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SECTION 00 3132
GEOTECHNICAL DATA

PART 1 - GENERAL

1.01 SUMMARY

A. Related Documents: General and Supplementary Conditions of the Contract, Division 01 General Requirements, and Drawings are applicable to this Section.

1.02 INVESTIGATION

A. An investigation of subsurface soil conditions at the building site was authorized by the Owner, and these investigations were made by Terracon Consultants, Inc., report number 92245559.Revision1, dated May 4, 2026.

1.03 REPORT

A. The complete report of the testing laboratory follows this section and is provided for information only.

B. Report and log of borings are available for Contractor's information but is not a warranty of subsurface conditions, nor is it a part of the Contract Documents.

1.04 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 Owner and Architect assume no responsibility for variations of subsoil quality or conditions.

C. The Owner and the Architect assume no responsibility for any conclusions or interpretations made on the basis of subsurface information contained in the contract documents.

PART 2 - NOT USED

PART 3 - NOT USED

END OF SECTION

Tomball ISD Intermediate School

Geotechnical Engineering Report

Tomball, Texas

May 4, 2026 | Terracon Project No. 92245559.Revision1

Prepared for:

Tomball Independent School District
310 South Cherry Street
Tomball, Texas 77375

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Houston, Texas 77043
P (713) 690-8989
Terracon.com

May 4, 2026

Tomball Independent School District
310 South Cherry Street
Tomball, Texas 77375

Attn: Mr. Zachery Boles – Chief Financial Officer
P: (281) 357-3100
E: zacheryboles@tomballisd.net

Re: Geotechnical Engineering Report
Tomball ISD Intermediate School
Hufsmith-Khorville Road and Future Innovation Drive
Tomball, Texas
Terracon Project No. 92245559.Revision1

Dear Mr. Boles:

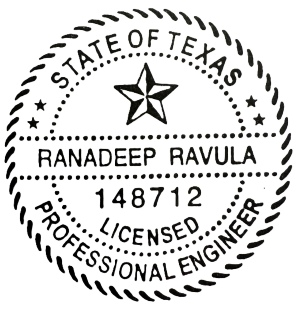
Terracon Consultants, Inc. (Terracon) is pleased to submit our geotechnical engineering report for the project referenced above in Tomball, Texas. We trust that this report is responsive to your project needs.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,

Terracon Consultants, Inc.
(Texas Firm Registration No.: F-3272)

Jonathan N. Han, P.E.
Project Engineer



Ranadeep Ravula, P.E.
Group Manager

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Site Location and Exploration Plans
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Supporting Information

Note: This report was originally delivered in a web-based format. **Blue Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the Terracon logo will bring you back to this page. For more interactive features, please view your project online at **client.terracon.com**.

Refer to each individual Attachment for a listing of contents.

Introduction

Terracon Consultants, Inc. (Terracon) is pleased to submit our Geotechnical Engineering report for the proposed construction of a intermediate school campus planned on a site located at the southwest corner of the intersection of Hufsmith-Khorville Road and Future Innovation Drive in Tomball, Texas. This project was authorized by Mr. Zachery Boles, Chief Financial Officer of Tomball Independent School District (TISD) through signature of the AIA® Document B221™ - 2018 between Tomball Independent School District (TISD) and Terracon dated March 5, 2026. This project was performed in general accordance with Terracon Document No. P92255559.Revision1, dated January 28, 2026.

The purpose of these services was to provide information and geotechnical engineering recommendations relative to:

- Boring logs with field and laboratory data;
- Description of subsurface conditions;
- Groundwater levels observed during drilling;
- Site and boring location plans;
- Site and subgrade preparation;
- Foundation design and construction;
- Seismic site class (based on IBC 2021); and
- Pavement design guidelines.

The geotechnical engineering Scope of Services for this project included the advancement of 16 test borings, laboratory, engineering analysis, and preparation of this report.

Maps showing the site and boring locations are shown on the **Site Location** and **Exploration Plan**, respectively. The results of the laboratory testing performed on soil samples obtained from the site during our field exploration are included on the boring logs in the **Exploration and Laboratory Results** section.

Project Description

Our initial understanding of the project was provided in our proposal and was discussed during project planning. A period of collaboration has transpired since the project was initiated, and our final understanding of the project conditions is as follows:

Item	Description
Proposed Improvements[1]	■ A two-story intermediate school building with an approximate footprint area of 50,000 square feet (sf). ■ Approximately 520 linear feet of new two-lane roadway. We understand that the new roadway will be designed and constructed as a Collector in accordance with Harris County guidelines. ■ A playground and concrete basketball court area. We understand that general subsurface information is requested at this time. No engineering recommendations will be provided at this time. ■ Associated surface pavements and driveways.
Building Construction[1]	Combination of steel-frame and concrete masonry unit (CMU) construction.
Finished Floor Elevation	Within approximately one to two feet above existing grade.
Maximum Loads	■ **Column loads (total)**: Up to 300 kips[1] ■ **Floor slab pressure**: 125 pounds per square foot (psf)
Planned Foundation Systems[1]	Either drilled-and-underreamed footings or augured cast-in-place piles.
Pavements	We assume both rigid (concrete) and flexible (asphalt) pavement sections are being considered.
Anticipated Traffic	■ Consists primarily of passenger vehicles in the parking areas and passenger vehicles combined with garbage trucks, buses, and large multi-axle delivery trucks from time-to-time in driveway areas. ■ We understand that future Innovation Drive will be classified as a collector street and will be designed and constructed in accordance with Harris County guidelines

1. Based on the information provided by Huckabee.

Site Conditions

The following description of site conditions is derived from our site visit in association with the field exploration.

Item	Description
Project Location	The project is located at the southwest corner of the intersection of Hufsmith-Khorville Road and Future Innovation Drive in Tomball, Texas. See **Site Location**.
Existing Improvements	The site was vacant at the time of our field exploration program. In addition, based on information provided to us by Huckabee Architects (Huckabee), a previous drainage ditch located in the north portion of the site and detention pond with an unknown depth located in the southwest portion of the site were backfilled as part of previous earthwork activities.
Current Ground Cover	Grass and weeds.
Existing Topography	Relatively level.

Geotechnical Characterization

Geology

Based on the geologic maps published by the Bureau of Economic Geology, the site for the proposed project is located on the upper Lissie formation, sometimes denoted the Montgomery formation. The upper Lissie formation is heterogeneous, containing interbedded layers of clay, sand and silt. This formation was deposited in mid-Pleistocene time in shallow coastal river channels and flood plains.

The clay present in the formation has been preconsolidated by a process of desiccation. Numerous wetting and drying cycles have produced a network of randomly oriented and closely-spaced joints, which are sometimes slickensided, that is, have a shiny appearance when exposed. The joint pattern strongly influences the engineering behavior of the soil.

The sand layers vary in compactness from loose to very dense, and in thickness from a fraction of an inch to many feet due to an irregular depositional environment. Sands are generally subrounded to subangular and vary from coarse to very fine, are poorly graded, and often contain significant amounts of silt-sized particles in the sand matrix.

The coastal plain in this region has a complex tectonic geology, several major features of which are: Gulf Coastal geosyncline, salt domes, and major sea level fluctuations during the glacial stages, subsidence and geologic faulting activities. Most of these geologic faulting activities have ceased for millions of years, but some are still active. A detailed geologic fault investigation and study of the site geology are beyond the scope of this report.

GeoModel

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data, geologic setting and our understanding of the project. This characterization, termed GeoModel, forms the basis of our geotechnical calculations and evaluation of the site. Conditions observed at each exploration point are indicated on the individual logs. The individual logs can be found in the **Exploration and Laboratory Results** and the GeoModel can be found in the **Figures** attachment of this report.

As part of our analyses, we identified the following model layers within the subsurface profile. For a more detailed view of the model layer depths at each boring location, refer to the GeoModel.

Model Layer	Layer Name	General Description
1	**Fill: Sandy Lean Clay and Sandy Fat Clay**	dark gray, gray, and tan, with sand pockets and calcareous and ferrous nodules
2	**Sandy Lean Clay, Silty Clay, and Sandy Silty Clay**	light gray, dark gray, gray, and tan, very soft to very stiff, with scattered roots, sand pockets, and calcareous and ferrous nodules
3	**Sandy Fat Clay**	light gray and tan, stiff, with sand pockets
4	**Silty Sand**	light gray and tan, medium dense to very dense, with clay pockets

The fill soils observed at this site were compacted to a least 95 percent of the maximum dry density as determined by the Standard Effort (ASTM D 698) and in-situ density tests were performed by Terracon (Terracon Project No. 92241275) at this site. It is our opinion that the degree of compaction of fill soils meet the project compaction requirements at the locations tested. If deeper fill soils are observed at the time of construction in the proposed building areas, Terracon should be contacted to provide further recommendations.

Laboratory Testing

Water soluble sulfate testing was performed on selected samples in the pavement areas at the time of our geotechnical services. The results are outlined in the table below.

Boring Number	Sample Depth (feet)	Sulfate Content (ppm)
B-12	0 to 2	<100
B-13	0 to 2	<100
B-14	0 to 2	120
B-15	0 to 2	<100

Groundwater Conditions

Borings B-1 through B-3, B-8, and B-10 were advanced using dry drilling techniques to depths of approximately 12 to 20 feet in an effort to evaluate groundwater conditions at the time of our field program. Wet rotary techniques were used thereafter to the termination depth of these borings (about 30 feet). Groundwater was not observed within the upper 12 to 20 feet due to utilizing wet rotary drilling techniques. Borings B-4 through B-7, B-9, and B-11 through B-16 were advanced using dry drilling techniques to their termination depths (about 5 to 30 feet) in an effort to evaluate groundwater conditions at the time of our field program. Groundwater was not observed at borings B-4 through B-7, B-9, and B-11 through B-16 during or upon completion of drilling.

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed. Therefore, groundwater levels during construction or at other times in the life of the structure may be present within the depths explored. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project and should be evaluated prior to construction.

Geotechnical Overview

Based on the information obtained from our subsurface exploration, the site can be developed for the proposed project. A summary of our findings and recommendations is provided below.

- Fill soils were observed at the ground surface at borings B-1 through B-9 and B-12 through B-15 and extended to depths that ranged from about 2 to 8 feet. Fill soils were observed at the ground surface at borings B-11 and extended to a depth of about 13 feet within the previous detention pond area. Fill soils may be present at varying depths and at other locations not explored during our field

program. The fill soils observed at this site were compacted to a least 95 percent of the maximum dry density as determined by the Standard Effort (ASTM D 698) and in-situ density tests were performed by Terracon (Terracon Project No. 92241275) at this site. It is our opinion that the degree of compaction of fill soils meet the project compaction requirements at the locations tested. If deeper fill soils are observed at the time of construction in the proposed building areas, Terracon should be contacted to provide further recommendations.

- Expansive soils were observed at this site. This report provides recommendations to help reduce the effects of soil shrinkage and expansion. However, even if these procedures are followed, some movement and distress in the building should be anticipated. The severity of distress will increase if any modification of the site results in excessive wetting or drying of the expansive soils. Eliminating the risk of movement associated with expansive soils may not be feasible. However, this risk can be significantly reduced if the building is designed as a structural slab over a void space with the structural loads supported by a foundation system terminated below the active zone. Terracon can provide recommendations for this option, if requested.

- A foundation system consisting of either drilled-and-underreamed footings or augered cast-in-place (ACIP) piles may be utilized to support the proposed building planned at this site.

- A minimum 48-inch thick select fill pad should be placed under the proposed building to provide uniform support to the floor slab and reduce the estimated Potential Vertical Rise (PVR) of the subgrade to approximately one inch or less.

- Pavement areas placed upon deeper fill soils will also be subject to future settlement of the fill. Complete excavation, removal, and recompaction of the fill soils in the pavement areas would reduce the potential for future settlement; however, complete excavation and removal of the fill soils within the proposed pavement areas would likely not be feasible. As an alternative, the settlement potential can be reduced by reworking the upper 3 feet of fill below the pavement areas (or up to the underlying native soils, whichever occurs first to reduce differential settlements, with the understanding that some settlement (which will likely result in increased maintenance of pavements) will likely occur.

- Rigid pavement sections vary from 5.0 to 7.0 inches of reinforced concrete with chemically treated subgrade.

- Flexible pavement sections vary from 2.0 to 2.5 inches of asphaltic concrete over 8.0 to 10.0 inches of base material with chemically treated subgrade.

- For the future Innovation Drive collector street, the minimum recommended rigid pavement section consisting of 7 inches of concrete over 8 inches of chemically

treated subgrade and the minimum recommended flexible pavement section consisting of 1½ inches of asphaltic concrete, over 8 inches of base course and 6 inches of chemically treated subgrade as per Harris County specifications.

This summary should be used in conjunction with the entire report for design purposes. Details were not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein. The section titled **General Comments** should be read for an understanding of the report limitations.

Earthwork

Earthwork is anticipated to include clearing and grubbing, excavations, and fill placement. The following sections provide recommendations for use in the preparation of specifications for the work. Recommendations include critical quality criteria, as necessary, to render the site in the state considered in our geotechnical engineering evaluation for foundations, floor slab, and pavements.

Site Preparation

Construction areas should be stripped of vegetation, topsoil, and other debris/unsuitable surface material. Proper site drainage should be maintained during construction so that ponding of surface runoff does not occur and cause construction delays and/or inhibit site access.

Once final subgrade elevations have been achieved, the exposed subgrade should be carefully proofrolled with a 20-ton pneumatic roller or equivalent equipment, such as a fully loaded dump truck, to detect weak zones in the subgrade. Special care should be exercised when proofrolling areas containing fill soils in an attempt to observe soft/weak zones within the fill soils. Weak areas detected during proofrolling, as well as zones of fill containing organic matter and/or debris, should be removed and replaced with soils exhibiting similar classification, moisture content, and density as the adjacent in-situ soils. Proofrolling should be performed under the direct observation of the Geotechnical Engineer or his/her representative.

Subsequent to proofrolling, and just prior to placement of fill, the exposed subgrade within the construction area should be evaluated for moisture and density. If the moisture and/or density do not meet the criteria described in **Fill Compaction Requirements** for on-site soils, the subgrade should be scarified to a minimum depth of 6 inches, moisture adjusted, and compacted to at least 95 percent of the Standard Effort (ASTM D698) maximum dry density.

Fill Material Types

Select fill and on-site soils to be used at this site for grade adjustments should meet the following criteria:

Fill Type	USCS Classification	Acceptable Location for Placement
Select Fill Soils	CL and/or SC (10≤PI≤20)	Must be used to construct the select fill building pad under the floor slab and for all grade adjustments within the building area.
On-site Soils	Varies	The on-site soils appear suitable for use as fill within the pavement areas, provided they are free of organics and debris.

If blended or mixed soils are intended for use as select fill, Terracon should be contacted to provide additional recommendations. Blended or mixed soils do not occur naturally. These soils are a blend of sand and clay and will require mechanical mixing at the site with a pulvimixer. If these soils are not mixed thoroughly to break down the clay clods and blend-in the sand to produce a uniform soil matrix, the fill material may be detrimental to the performance of the foundations. If blended soils are used, we recommend that additional samples of the blended soils as well as the clay clods, be obtained prior to and during earthwork operations to evaluate if the blended soils can be used in lieu of select fill. The actual type and amount of mechanical mixing at the site will depend on the amount of clay and sand, and properties of the clay.

Fill Compaction Requirements

Item	Description
Fill Lift Thickness	The fill soils should be placed on prepared surfaces in lifts not to exceed 8 inches loose measure, with compacted thickness not to exceed 6 inches.
Compaction Requirements	■ The select fill and on-site soils should be compacted to at least 95 percent of the Standard Effort (ASTM D 698) maximum dry density. ■ The select fill soils should be moisture adjusted to within 2 percent of the optimum moisture content. ■ The on-site clay soils should be moisture conditioned to between optimum and +4 percent of the optimum moisture content.

Prior to any filling operations, samples of the proposed borrow and on-site materials should be obtained for laboratory moisture-density testing. The tests will provide a basis

for evaluation of fill compaction by in-place density testing. A qualified soil technician should perform sufficient in-place density tests during the filling operations to evaluate that proper levels of compaction, including dry unit weight and moisture content, are being attained.

Utility Trench Backfill

Utility trenches are a common source of water infiltration and migration. All utility trenches that penetrate beneath the building should be effectively sealed to restrict water intrusion and flow through the trenches that could migrate below the building. We recommend constructing an effective clay "trench plug" that extends at least 5 feet out from the face of the building exterior. The plug material should consist of clay compacted at a water content at or above the soils optimum water content. The clay fill should be placed to completely surround the utility line and be compacted in accordance with recommendations in this report.

Grading and Drainage

All grades must provide effective drainage away from the building during and after construction. Water permitted to pond next to the building can result in distress in the building. These greater movements can result in unacceptable differential floor slab movements, cracked slabs and walls, and roof leaks. Building slab and foundation performances described in this report are based on effective drainage for the life of the structures and cannot be relied upon if effective drainage is not maintained.

Exposed ground should be sloped away from the building for at least 10 feet beyond the perimeter of the building. After building construction and landscaping, we recommend verifying final grades to document that effective drainage has been achieved. Grades around the building should also be periodically inspected and adjusted as necessary, as part of the building's maintenance program.

Planters located within 10 feet of the proposed building should be self-contained to prevent water accessing the building and pavement subgrade soils. Locate sprinkler mains and spray heads a minimum of 5 feet away from the building lines. Low-volume, drip-style landscaped irrigation should not be used near the building. Collect roof runoff in drains or gutters. Discharge roof drains and downspouts onto pavements and/or flatworks which slope away from the proposed building or extend down spouts a minimum of 10 feet away from building.

Flatworks and pavements will be subject to post construction movement. Maximum grades practical should be used for paving and flatwork to prevent water from ponding. Allowances in final grades should also consider post-construction movement of flatwork,

particularly if such movement would be critical. Where paving or flatwork abuts the building, effectively seal and maintain joints to prevent surface water infiltration.

Wet Weather/Soft Subgrade Considerations

Construction operations may encounter difficulties due to wet or soft surface soils becoming a general hindrance to equipment, especially following periods of wet weather. If the subgrade cannot be adequately compacted to the minimum densities as described previously, one of the following measures will be required: 1) removal and replacement with select fill, 2) chemical treatment of the soil to dry and improve the condition of the subgrade, or 3) drying by natural means if the schedule allows. Based on our experience with similar soils in this area, chemical treatment is generally an efficient and effective method to improve the condition of wet and weak subgrade. Terracon should be contacted for additional recommendations if chemical treatment is planned to be utilized due to soft and wet subgrade.

Foundation Systems

Based on the subsurface conditions observed during our field and laboratory programs, a foundation system consisting of either drilled-and-underreamed footings or augered cast-in-place-piles may be utilized to support the proposed building planned at this site, provided the subgrade is properly prepared as described in this report. Recommendations for these types of foundation systems are provided in the following sections, along with other geotechnical considerations for this project.

Design Recommendations – Drilled-and-Underreamed Footings

Item	Description
Minimum Embedment Depth [1]	10 feet below existing grade (grade at the time of our field program)
Allowable Bearing Pressures [2]	Net dead plus sustained live load – 4,800 psf Net total load – 7,200 psf
Maximum Underream-to-Shaft Diameter Ratio	3:1
Minimum Underream-to-Shaft Diameter Ratio [3]	2:1
Estimated Uplift Pressure Due to Post-Construction Heave of the Clay Soils [4]	1,000 psf

Item	Description
Minimum Percentage of Steel [5]	0.5 percent
Approximate Post-Construction Settlement [6]	One inch or less
Estimated Differential Settlement [7]	Approximately ½ of post-construction settlement
Allowable Passive Pressure [8]	1,000 psf
Uplift Resistance [9]	Foundation Weight (150 pcf) & Soil Weight (120 pcf)

1. The footings should extend through the fill soils and bear within the native undisturbed clay soils. For footings located within the previous detention pond area, the footings should extend through the fill soils and bear at a minimum depth of 13 feet below existing grade within native undisturbed clay soils.
2. Whichever condition yields a larger bearing area.
3. This minimum underream-to-shaft diameter ratio should result in a large enough diameter of the underream to overcome uplift forces on the footing without causing local soil failure to the overlying soils.
4. The magnitude of uplift is difficult to predict and will vary with in-situ moisture contents. This uplift pressure can be approximated over the entire perimeter of the shaft above the top of the underream.
5. The footings should contain sufficient vertical reinforcing steel throughout the entire shaft length to resist uplift (tensile) forces due to post-construction heave of the clay soils. The amount of reinforcing steel required can be computed by assuming that the dead load of the structure surcharges the footing, that the above estimated tensile force acts vertically on the shaft, and that the underream acts as a rigid anchor.
6. This estimated post-construction settlement of the drilled-and-underreamed footings is without considering the effect of stress distribution from adjacent foundations and assuming proper construction practices are being followed. A clear distance between the footings of one underream diameter of the larger footing should be provided between the underreams to develop the recommended bearing pressures and to control settlements. If a clearance of one diameter cannot be maintained in every case, the above bearing capacities should be reduced by 20 percent for a clearance between one half and one underream diameters. Underreams closer than a clearance of one half of an underream diameter are not recommended.
7. The differential settlement will result from variances in subsurface conditions, loading conditions and construction procedures, such a cleanliness of the bearing area or flowing water in the shaft.
8. For footings placed against an undisturbed vertical face of the in-situ soils. Lateral resistance of the drilled-and-underreamed footings is primarily developed by passive resistance of the soils against the side of the footing. Due to surface effects and the presence of fill and expansive soils, the lateral resistance of the upper 4 feet of the soils at the surface for exterior footings should be neglected unless area paving is provided up to the edge of the building.
9. Structural uplift loads on the drilled-and-underreamed footings will be resisted by the dead weight of the footings and supported structure plus the weight of a soil wedge above the

Item	Description
	footing. The soil wedge can be assumed to extend upward from the bottom of the underream at a slope of 4 vertical to 1 horizontal.

Construction Considerations – Drilled-and-Underreamed Footings

Drilled excavations to a depth of 10 feet below existing grade will be necessary for installation of drilled-and-underreamed footings for the proposed building planned at this site. The excavations should be performed with equipment capable of providing a relatively clean bearing area. The presence of secondary structures such as sand pockets, ferrous and calcareous nodules, etc., can cause sloughing during footing excavation. Thus, the drilling contractor should have casing available in the event that sloughing causes improperly formed shafts.

Based on our groundwater observations (refer to **Groundwater Conditions**), groundwater is not expected to be a major concern during construction at the recommended bearing depth. However, depending on climatic conditions, groundwater levels may vary from the levels observed during our field program. Water must not be allowed to accumulate in the bottom of the footing excavations. The contractor should be prepared to remove water from the drilled footings, if necessary. To reduce the potential for water seepage into the footing excavation and to minimize disturbance to the bearing area, we recommend that concrete and steel be placed as soon as possible after footing excavations are completed. Preferably, footing excavations should be backfilled with concrete within about 2 to 4 hours of completion of the drilling and in no case should an excavation be left open overnight. The concrete placed in the excavations should have a 6-inch slump with a plus or minus one inch tolerance. The bottom of each footing excavation should be free of all loose materials and/or water, and the bearing surface should be evaluated immediately prior to placing concrete.

Based on the available field and laboratory data, the underreams constructed as described in this report should remain stable for a short period of time. However, if underreams are marginally stable due to water seepage and/or the presence of sloughing soils, successful construction of underreamed footings may be possible by performing the sequence of construction without interruption, that is, each footing drilled, underreamed, and backfilled with concrete in one continuous operation. The contractor must coordinate the operation very closely to have concrete on site at the time each footing is drilled and underreamed so that no shaft or underream is drilled without concrete standing by, ready to be placed. Additional measures to reduce the potential for caving of the underream would be to limit the underream-to-shaft diameter ratio to 2.5:1 or 2:1 or to install straight shaft footings in isolated problem areas. If straight-shaft footings are planned at the site, Terracon should be contacted for additional recommendations.

Grade Beams – Drilled-and-Underreamed Footings

Grade beams associated with the drilled-and-underreamed footings and a grade-supported floor slab should be designed to span between the footings without subgrade support. We understand the grade beams are planned to be constructed without a void space. However, due to the underlying clay soils, nominal upward movement of the grade beams may occur during moisture variations of the subgrade.

Backfill against the outside face of the grade beams should consist of select fill used to prepare the building pad. The select fill should be uniformly compacted to at least 95 percent of the Standard Effort (ASTM D 698) maximum dry density at a moisture content within 2 percent of optimum moisture content.

Design Recommendations – Augered Cast-in-Place (ACIP) Piles

The ACIP piles planned for the proposed building should be designed to resist both horizontal and vertical forces. Horizontal forces can be resisted by the passive pressure of soil acting on the vertical face of the ACIP piles. Vertical downward forces can be resisted by the allowable end bearing pressure of the soils at the bottom of the ACIP piles. Vertical uplift forces can be resisted by the dead weight of the building and its foundation. When foundation concrete is cast in direct contact with excavation sides, an allowable side friction value can also be used to resist vertical loads.

The allowable design criteria for utilization of ACIP piles as the foundation system for the proposed building are presented in the following table. The table includes the effective soil unit weights, shear strength parameters, allowable end bearing pressure, and side friction values. Furthermore, the lateral subgrade modulus values are provided for the cyclic and static loading conditions. Care should be exercised to utilize the appropriate loading condition in the analysis.

The design parameters presented in the following table are applicable for the natural, undisturbed soils. The capacity of the upper 4 feet of the on-site soils should be disregarded due to surface effects and presence of fill and expansive soils. ACIP piles should extend at least 2 feet or half a shaft diameter, whichever is greater, into the desired bearing strata in order to use the recommended allowable end bearing pressures. The design parameters provided were calculated assuming groundwater is below 30 feet.

Long-term settlement of the drilled straight shaft foundation, designed and constructed in accordance with the recommendations presented in this report, should be about one inch or less.

Design Parameters for Augered Cast-in-Place (ACIP) Piles								
Below Existing Grade (feet)[1]	Effective Unit Weight (pcf)	Allowable Unit Skin Friction Resistance (psf)[2]	Allowable End Bearing Pressure (psf)[3]	Lateral Subgrade Modulus (pci)[4]		Strain ε_{50} (in/in)	Undrained Shear Strength (psf)	Angle of Internal Friction (degree)
				Static	Cyclic			
0 to 13	130	Disregard						
13 to 23	130	700	6,000	700	275	0.005	2,000	---
23 to 30	120	780	8,000	90	90	---	---	30

1. Grade at the time of our field program.
2. The allowable side friction is based on a rectangular pressure distribution.
3. The net allowable end bearing pressure refers to the pressure at the foundation bearing level in excess of the surrounding overburden pressure. A minimum penetration of 2 feet or one-half a shaft diameter, whichever is greater, into the desired bearing strata should be achieved with a minimum of 4 feet of the selected bearing stratum beneath the shaft tip to use the recommended allowable end bearing pressure.
4. The lateral subgrade modulus values are provided for static and cyclic loading conditions. An appropriate loading condition should be selected for analysis.

Design of piles should also include an evaluation of the structural capacity of the foundation element which may limit the allowable capacity.

There are numerous factors which contribute to the behavior of groups subjected to axial load. Several of these factors are foundation type, size and length, spacing, overall group size, loading conditions, installation procedures, and soil type and strength. We recommend a minimum spacing of three diameters, center-to-center, for piles placed in groups beneath square or rectangular caps. However, for piles placed in a linear pattern beneath load bearing walls, a minimum spacing of two diameters center-to-center would generally be acceptable. Closer spacing than three diameters in groups or two diameters in rows could result in increased group settlement and a reduction of load-carrying capacity of individual foundation elements.

Settlement of a single, isolated pile will depend on the elastic properties of the foundation, the applied load, and the interaction of the soil and foundation. Settlement of a single, isolated pile is anticipated to be primarily elastic and will occur relatively soon as load is applied. Significant consolidation settlement of a single, isolated pile due to applied load is not anticipated for the allowable capacities. Our experience indicates that a single, isolated foundation loaded to about one-half of its ultimate capacity will result in settlements of about one inch or less. Groups generally undergo more settlement than single, isolated foundation elements for the same applied load. Consolidation settlement due to the applied load will depend on the pile cap size and

number of piles beneath the cap. To evaluate the settlement response of the pile groups, we recommend that details of the planned pile groups (such as length, size, and arrangement) be provided to us. Once we receive the pile group details, we can perform a detailed settlement analysis and provide our comments in a supplemental letter report.

The deep foundations will provide resistance to lateral loads through the passive earth pressure acting on the side of the foundation. A detailed lateral load analysis of the proposed ACIP piles was beyond the scope of this project. The parameters provided previously are for a single, isolated pile. An appropriate reduction factor should be utilized for pile groups. Lateral loads should not exceed the structural capacity of the individual ACIP piles.

Deep foundations will provide resistance to structural uplift loads through the mobilization of the skin friction acting at the interface of the pile sidewall and the adjacent soils. The allowable skin friction values provided in the previous table may be utilized to calculate the uplift resistance for piles.

As presented in **Construction Considerations - Augered Cast-in-Place (ACIP)**, we recommend that at least one full scale ACIP pile load test be performed to evaluate the actual ACIP pile capacity at this specific site.

Construction Considerations – Augered Cast-in-Place (ACIP) Piles

The performance of ACIP piles is dependent on installation procedures. We recommend the following measures be taken for ACIP pile installation at this site:

- The grout pump should be calibrated. The Deep Foundation Institute (DFI) Inspector's Guide provides guidelines for grout pump calibration that should be followed. We recommend the grout pump be calibrated at the beginning of the project and recalibrated after any significant pump maintenance or repairs. Calibration of the pump is critical to monitoring the incremental grout factor during installation and determining the overall grout factor for each pile.

- The grout used should be measured frequently to maintain consistency. In accordance with the Proceedings of the 83rd Annual Transportation Research Board (TRB) meeting, grout flow rates between 10 to 25 seconds utilizing a typical ¾-inch diameter flow cone are considered appropriate.

- An initial grout head should be developed at the bottom of excavation, prior to withdrawal of the auger. A positive pressure head of at least 5-foot of grout should be maintained at all times. We recommend that the initial 5-foot of grout be pumped prior to initial withdrawal of the auger, rather than over-pumping the initial 5-foot increment.

- The number of pump strokes required to maintain the 5-foot of head should be determined during installation of the test reaction piles and can be visually monitored by observing the "grout return depth" upon removal of the auger. A grout return depth of 5 to 10 feet is generally considered acceptable.

- Grouting of the piles should continue until grout contaminated with soil cuttings has stopped flowing from the hole and uncontaminated grout has completely filled the hole.

- Field observations should be made to confirm the amount of grout used in each pile. According to data published by the DFI, the grout factor, or total volume of the grout in each pile, should be at least 115 percent of the theoretical volume for each pile. In order to promote a uniform pile diameter, we recommend that the incremental grout factor (volume) be measured for each 5-foot increment of pile length.

- The grout pressure should be monitored during the field grouting and maintained at a pressure between 350 to 500 psi to reduce the potential for grout necking and soil caving.

Production ACIP pile installation should be closely observed by a qualified technician experienced in ACIP pile installation. The installation sequence and technique should be evaluated to determine that ACIP pile installation is being performed in general accordance with project specifications.

Varying installation methods and soil conditions can have an effect on the soil-pile interaction and capacity. We recommend that at least one full scale pile load test be performed to evaluate the actual ACIP pile capacities of each type of pile planned to be used at this specific site. The results of load test on production type piles can be analyzed to estimate unit skin friction (even though the piles are not instrumented) and, depending on the results, potentially justify the use of higher capacities than computed. The pile for the load test should extend to a depth similar to the proposed design depth of the piles at the site. Terracon should be involved in evaluating and selecting the appropriate depths for the test piles. The test piles should be tested to failure as defined by pile test load procedures. Installation of test piles should be identical to planned production installation procedures.

Foundation Construction Monitoring

The performance of the foundation systems for the proposed structure will be highly dependent upon the quality of construction. Thus, we recommend that fill pad compaction and foundation installation be observed full time by an experienced Terracon soil technician under the direction of our geotechnical engineer. During foundation installation, the base of the foundation excavations should be observed to evaluate the

condition of the subgrade. We would be pleased to develop a plan for compaction and foundation installation observation to be incorporated in the overall quality control program.

Floor Slab

Planned finished grades for the proposed building were not available at the time of this report. We anticipate that the finished floor elevation of the proposed building is planned to be within about one to two feet above the existing grade. If the grading is planned to be altered from what has been previously described, Terracon should be notified to review and/or modify our recommendations given in this subsection.

The near surface soils observed at this site generally exhibit a variable expansion potential. These soils can subject the interior floor slab of the building to significant movements (due to shrinking and swelling) with fluctuations in their moisture content. This movement potential is influenced primarily by the properties of the subgrade soils, as well as the moisture content of the subgrade at the time of construction, overburden pressures, and the stability of the moisture contents throughout the life of the building. Based on the information developed from our field and laboratory programs and on method TEX-124-E in the Texas Department of Transportation (TxDOT) Manual of Testing Procedures, we estimate that the subgrade soils at this site exhibit a Potential Vertical Rise (PVR) of up to approximately 2½ inches. Therefore, we highly recommend that the near-surface soils be prepared as stated below to reduce the potential for slab movement associated with volumetric changes of the near-surface clay soils due to moisture variations to a more acceptable level. The actual movements could be greater if poor drainage, ponded water, and/or other sources of moisture are allowed to infiltrate beneath the structure after construction.

The most common method of subgrade preparation to reduce potential expansion of the subgrade would be to provide a pad of properly placed and compacted select fill beneath the grade-supported floor slabs. The corresponding decrease in the potential soil movements is primarily a function of the fill pad thickness and the moisture levels of the underlying clay subgrade. While the indicated preparations do not eliminate the potential for soil movement, the magnitude of such movements should be reduced to more acceptable levels. To provide uniform support to the floor slab and to reduce the estimated PVR to approximately one inch or less, we recommend that a minimum 48 inches of properly placed and compacted select fill material be constructed immediately beneath the floor slab. The select fill pad should extend a minimum of 5 feet beyond the edge of the building area. The final exterior grade adjacent to the structure should be sloped to promote effective drainage away from the structure.

Select fill should be utilized for all grade adjustments within the proposed building area. The subgrade and select fill soils should be prepared as outlined in the **Earthwork**

section of this report, which contains material and placement requirements for select fill, as well as other subgrade preparation recommendations.

The subgrade soils for flatwork outside of the structure which will be sensitive to movement should be prepared as discussed previously. This preparation will be important on surrounding sidewalks and paving immediately adjacent to the structure. If these adjacent flatwork areas are not prepared as stated above for the building area, the estimated PVR for these areas could approach those indicated previously for in-situ conditions. If the soils swell in these areas, this movement could result in significant distress to the adjacent sidewalks and paving and possibly result in reversed drainage (flow of runoff toward the structure) around the perimeter of the structure.

Seismic Considerations

Description	Value
2021 International Building Code (IBC)[1]	D[2]

1. In general accordance with the *2021 International Building Code,* Table 1613.3.2 and *ASCE 7,* Chapter 20.
2. The 2021 International Building Code (IBC) requires a site soil profile determination extending a depth of 100 feet for seismic site classification. The current scope did not include a 100-foot deep soil boring. Borings for the building extended to a maximum depth of approximately 30 feet. Based on the International Building Code (IBC) 2021, "When the soil properties are not known in sufficient detail to determine the Site class, Site Class D shall be used unless the building official or Geotechnical data determines that Site Class E or F is likely to be present at the site." Therefore, based on our knowledge and experience with the local site geology and a review of available field and laboratory data, the seismic site class in accordance with the IBC 2021 should be assumed to be Site Class D.

Pavements

Once the subgrade is properly prepared, both flexible pavement systems (consisting of asphaltic concrete and base material) and rigid pavement systems may be considered for this project. Detailed traffic loads and frequencies were not available at the time of this report. When actual traffic conditions have been determined Terracon should be contacted to review the information to consider a need for revision of the pavement designs and related recommendations.

The top 6 to 8 inches of the finished subgrade soils directly beneath the pavements should be chemically treated with lime or a mixture of lime-flyash. The decision about

the type and proper amount of additive should be made after the subgrade is open for inspection. Chemical treatment will increase the supporting value of the subgrade and decrease the effect of moisture on subgrade soils. These 6 to 8 inches of treatment is a required part of the pavement design and is not a part of the site and subgrade preparation for wet/soft subgrade conditions.

Listed in the following sections are pavement component thicknesses, which may be used as a guide for pavement systems at the site and for the traffic classifications stated herein. These systems were derived based on general characterization of the subgrade. Specific testing (such as CBR's, resilient modulus tests, etc.) was not performed for this project to evaluate the support characteristics of the subgrade.

Parking and Driveway Areas

As previously stated, detailed traffic loads and frequencies were not available. However, we anticipate that traffic will consist primarily of passenger vehicles in the parking areas and passenger vehicles combined with buses, garbage trucks, and large multi-axle delivery trucks from time-to-time in driveway areas.

Tabulated in the following table are the assumed traffic frequencies and loads used to design pavement sections for the parking and driveway areas of this project.

Pavement Area	Traffic Design Index [1]	Description
Automobile Parking Areas	DI-1	Light traffic (Few vehicles heavier than passenger cars, no regular use by heavily loaded two axle trucks/buses.) (EAL [2] < 6)
Driveways (Light Duty)	DI-2	Medium to light traffic (Similar to DI-1 including not over 50 loaded two axle trucks/buses or lightly loaded larger vehicles per day. No regular use by heavily loaded trucks with three or more axles.) (EAL = 6-20)
Driveways and Truck Traffic Areas (Medium Duty)	DI-3	Medium traffic (Including not over 300 heavily loaded two axle trucks/buses plus lightly loaded trucks with three or more axles and no more than 30 heavily loaded trucks with more than three axles per day.) (EAL = 21-75)

1. Based on NSSGA traffic design indices.
2. Equivalent daily 18-kip single-axle load applications.

Listed below are pavement component thicknesses, which may be used as a guide for pavement systems at the site for the traffic classifications stated herein. These systems were derived based on general characterization of the subgrade. Specific testing (such as CBR's, resilient modulus tests, etc.) was not performed for this project to evaluate the support characteristics of the subgrade.

Rigid Pavement System			
Component	**Material Thickness, Inches**		
	DI-1	**DI-2**	**DI-3**
Reinforced concrete	5.0	6.0	7.0
Treated subgrade	6.0	6.0	6.0

Flexible Pavement System		
Component	**Material Thickness, Inches**	
	DI-1	**DI-2**
Asphaltic concrete	2.0	2.5
Base material	8.0	10.0
Treated subgrade	6.0	6.0

Waste dumpster areas should be constructed of at least 7 inches of reinforced concrete pavement. The concrete pad areas should be designed so that the vehicle wheels of the collection truck are supported on the concrete while the dumpster is being lifted to support the large wheel loading imposed during waste collection.

County Roadways

We understand the future Innovation Drive planned to be extended westbound from the existing Huffsmith-Khorville Road. We understand these roadways are classified as "Collector" and will be designed and constructed in accordance with Harris County specifications.

Based on the Regulations of Harris County, Texas for the Approval and Acceptance of Infrastructure, January 1, 2019, we have performed roadway design calculations using the AASHTO 1993 Guide for Design of Pavement Structures to evaluate the approximate ESALs supported by the minimum recommended pavement sections. This estimation of pavement sections are based on the assumption that excellent drainage is maintained over a 20-year design life of the pavement and that pavement moisture levels approach

saturation one percent of the time or less. We would be pleased to provide recommendations for pavement section thicknesses for specific traffic loadings if that information is provided.

The following tables provide our recommendations for minimum thicknesses of rigid and flexible pavement sections for the traffic conditions described herein.

Rigid Pavement Section		
Reinforced Concrete Thickness (inches)	**Chemically Treated Subgrade Thickness (inches)**	**Approximate ESALs Supported**
7	8	Less than 475,000

Flexible Pavement Section			
Asphaltic Concrete Surface (inches)	**Cement Stabilized Crushed Aggregate Base (inches)**	**Chemically Treated Subgrade Thickness (inches)**	**Approximate ESALs Supported**
1½	8	6	Less than 475,000

Material Requirements

The material requirements for the county roadways shall be subject to the jurisdiction of the Harris County Engineering Department.

- All concrete pavements shall have a minimum design and in place compressive strength of 3,000 psi at 28 days.
- The reinforcing steel bar size, reinforcing bar spacing, construction and expansion join spacing, and pavement construction considerations should be in accordance with the Regulations of Harris County, Texas for the Approval and Acceptance of Infrastructure.
- The hot mix asphalt shall meet the requirements of "Harris County Standard Specification, Item No. 250 and 340".
- The cement stabilized crushed aggregate base course shall meet the requirements in "Harris County Standard Specification, Item No. 231".
- The geotechnical engineer shall provide subgrade treatment recommendations including type of stabilizer and anticipated application rate (lb/yd2) to develop the required subgrade density design requirements. Our recommendations for treated subgrade are presented below.

Presented below are our recommended material requirements for the various pavement sections.

Reinforced Concrete Pavement – The materials and properties of reinforced concrete pavement should meet applicable requirements in the ACI Manual of Concrete Practice. The portland cement concrete mix should have a minimum 28-day compressive strength of 3,500 psi.

If river gravel is planned to be utilized in the portland cement concrete mix, Terracon should be contacted for additional services. The presence of river gravel in the portland cement concrete mix can result in excessive cracking and distress to the concrete pavement as a result of differing thermal expansion properties between the river gravel and cement paste. Special care should be taken in developing the project's portland cement concrete mix design, joint layout, and placement to help reduce the potential for excessive cracking and distress if river gravel is planned to be utilized for the project.

Reinforcing Steel – ACI recommendations indicate that distributed steel reinforcement is not necessary when the pavement is properly jointed to form short panel lengths that will help reduce intermediate cracking. Provided the concrete pavement is designed and constructed as stated herein, the installation of reinforcing steel is optional and should be evaluated by the design team. Proper layout and installation of the joints within the pavement is critical to help control intermediate cracking.

If reinforcing steel is planned to be utilized in the concrete pavement by the design team, the following amount of reinforcing steel should be used as a guideline:

- DI-1: #3 bars spaced at 18 inches or #4 bars spaced at 24 inches on centers in both directions.
- DI-2: #3 bars spaced at 12 inches or #4 bars spaced at 18 inches on centers in both directions.
- DI-3: #4 bars spaced at 18 inches on centers in both directions.

Control Joint Spacing – ACI recommendations indicate that control joints should be spaced at a maximum spacing of 30 times the thickness of the pavement for unreinforced parking lot pavements. Furthermore, ACI recommends a maximum control joint spacing of 12.5 feet for 5-inch pavements and a maximum control joint spacing of 15 feet for 6-inch or thicker pavements. Sawcut control joints should be cut within 4 to 12 hours of concrete placement to help control the formation of plastic shrinkage cracks as the concrete cures. The depth of the joint should be at least one-quarter of the slab depth when using a conventional saw or one inch when using early entry saws. The width of the cut should be in accordance with the joint sealant manufacturer recommendations.

Expansion Joint Spacing – ACI recommendations indicate that regularly spaced expansion joints may be deleted from concrete pavements. Therefore, the installation of expansion joints is optional and should be evaluated by the design team.

Construction Joints – When concrete is planned to be placed at different times, we recommend the use of a construction joint between paving areas. The construction joint should consist of a butt joint (not a keyway joint).

Concrete Curing Compound – A concrete curing compound, such as a Type 2 membrane curing compound conforming to TxDOT DMS-4650, "Hydraulic Cement Concrete Curing Materials and Evaporation Retardants" or equivalent, should be applied to the concrete surface immediately after placement of the concrete in accordance with TxDOT 2014 Standard Specifications Item 360.

Dowels at Expansion/Construction Joints – The smooth dowels at expansion/construction joints should be spaced at 12-inch centers and consist of the following:

- DI-1: 5/8-inch diameter, 12-inches long with 5-inch embedment.
- DI-2: 3/4-inch diameter, 14-inches long with 6-inch embedment.
- DI-3: 7/8-inch diameter, 14-inches long with 6-inch embedment.

One end of the dowels should either be greased or sleeved to allow for lateral movement to occur.

Hot Mix Asphaltic Concrete Surface Course – The asphaltic concrete surface course should be plant mixed, hot laid Type D (Fine Graded Surface Course) meeting the requirements in TxDOT 2014 Standard Specifications Item 340. Specific criteria for the job specifications should include compaction to within an air void range of 3.8 to 8.5 percent calculated using the maximum theoretical specific gravity of the mix measured by TxDOT Tex-227-F. The asphalt cement content by percent of total mixture weight should be within ± 0.5 percent asphalt cement from the job mix design.

Base Material – Base material should be composed of crushed limestone or crushed concrete meeting the requirements of TxDOT 2014 Standard Specifications Item 247, Type A or D, Grade 1 or 2. The base material should be compacted to at least 95 percent of the Modified Effort (ASTM D1557) maximum dry density at moisture content within 2 percent of the optimum moisture content.

Lime-Flyash Treated Subgrade – The low to medium plasticity on-site clay soils (PI<15) should be treated with lime-flyash in accordance with TxDOT 2014 Standard Specifications Item 265. Based on the classification test results, we recommend about 2 to 3 percent lime and 7 to 8 percent flyash by dry weight be used for estimating and planning. The percentages are given as application by dry weight and are typically equivalent to about 10 to 15 pounds of lime and 35 to 40 pounds of flyash per square yard per 6-inch depth and 13 to 20 pounds lime and 46 to 52 pounds of flyash per square yard per 8-inch depth. Lime-flyash is also available pre-mixed, typically in percentages of 20 to 30 percent lime and 70 to 80 percent flyash. These pre-mixed products may be used if preferred at a rate of 50 pounds per square yard per 6-inch depth and at a rate of 66 pounds per square yard per 8-inch depth. The actual quantity

of lime-flyash should be determined at the time of construction based on laboratory testing conducted using bulk samples of the subgrade soils. The subgrade should be compacted to at least 95 percent of the Standard Effort (ASTM D 698) maximum dry density at a moisture content within 2 percent of the optimum moisture content.

Lime Treated Subgrade – The medium to high plasticity on-site clay soils (PI≥15) should be treated with lime in accordance with the TXDOT 2014 Standard Specifications Item 260. The amount of lime should be determined for subgrade soils by conducting laboratory tests just prior to construction. Based on the classification test results, we recommend that about 5 to 7 percent lime by dry weight be used for estimating and planning. The percentages are given as application by dry weight and are typically equivalent to about 25 to 35 pounds of lime per square yard per 6-inch depth and about 33 to 46 pounds of lime per 8-inch depth. The actual quantity of lime should be determined at the time of construction based on lime determination tests conducted using bulk samples of the subgrade soils. The pulverization, mixing and curing of the lime treated subgrade is of particular importance in these clays. The subgrade should be compacted to a minimum of 95 percent of the Standard Effort (ASTM D 698) maximum dry density at a moisture content between optimum and 4 percent wet of the optimum moisture content.

Preferably, traffic should be kept off the treated subgrade for 7 days to facilitate curing of the soil-chemical mixture. In addition, the subgrade is not suitable for heavy construction traffic prior to paving.

The pavement design methods described above are intended to provide structural sections with adequate thickness over a particular subgrade such that wheel loads are reduced to a level the subgrade can support. The support characteristics of the subgrade for pavement design do not account for shrink/swell movements of an expansive clay subgrade such as the soils encountered at this site. Thus, the pavement may be adequate from a structural standpoint, yet still experience cracking and deformation due to shrink/swell related movement of the subgrade. Post-construction subgrade movements and some cracking of pavements are not uncommon for clay subgrade conditions such as those observed at this site. Reducing moisture changes in the subgrade is important to reduce shrink/swell movements. Although chemical treatment will help to reduce such movement/cracking, this movement/cracking cannot be feasibly eliminated.

Related civil design factors such as subgrade drainage, shoulder support, cross-sectional configurations, surface elevations and environmental factors which will significantly affect the service life must be included in the preparation of the construction drawings and specifications. Normal periodic maintenance will be required.

Long-term pavement performance will be dependent upon several factors, including maintaining subgrade moisture levels and providing for preventative maintenance. The

following recommendations should be implemented to help promote long-term pavement performance:

- The subgrade and the pavement surface should be designed to promote proper surface drainage, preferably at a minimum grade of 2 percent;
- Install joint sealant and seal cracks immediately;
- Extend curbs into the treated subgrade for a depth of at least 4 inches to help reduce moisture migration into the subgrade soils beneath the pavement section; and
- Place compacted, low permeability clayey backfill against the exterior side of the curb and gutter.

Preventative maintenance should be planned and provided for the pavements at this site. Preventative maintenance activities are intended to slow the rate of pavement deterioration, and consist of both localized maintenance (e.g. crack and joint sealing and patching) and global maintenance (e.g. surface sealing). Prior to implementing any maintenance, additional engineering observations are recommended to determine the type and extent of preventative maintenance.

General Comments

Our work is conducted with the understanding of the project as described in the proposal and incorporates collaboration with the design team as we completed our services to verify assumptions. Revision of our understanding to reflect actual conditions important to our work was based on these verifications and it is reflected in this report. The design team should collaborate with Terracon to confirm these assumptions and to prepare the final design plans and specifications. This facilitates the incorporation of our opinions related to implementation of our geotechnical recommendations. Any information conveyed prior to the final report is for informational purposes only and should not be considered or used for decision-making purposes.

Our analysis and opinions are based upon our understanding of the geotechnical conditions in the area, the data obtained from our site exploration and from our understanding of the project. Variations will occur between exploration point locations, across the site, or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in the final report, to provide observation and testing services during grading, excavation, foundation construction and other earth-related construction phases of the project. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other services should be undertaken.

Our services and any correspondence are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third party beneficiaries intended. Any third party access to services or correspondence is solely for information purposes only. Reliance upon the services and any work product is limited to our client, and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing.

Figures

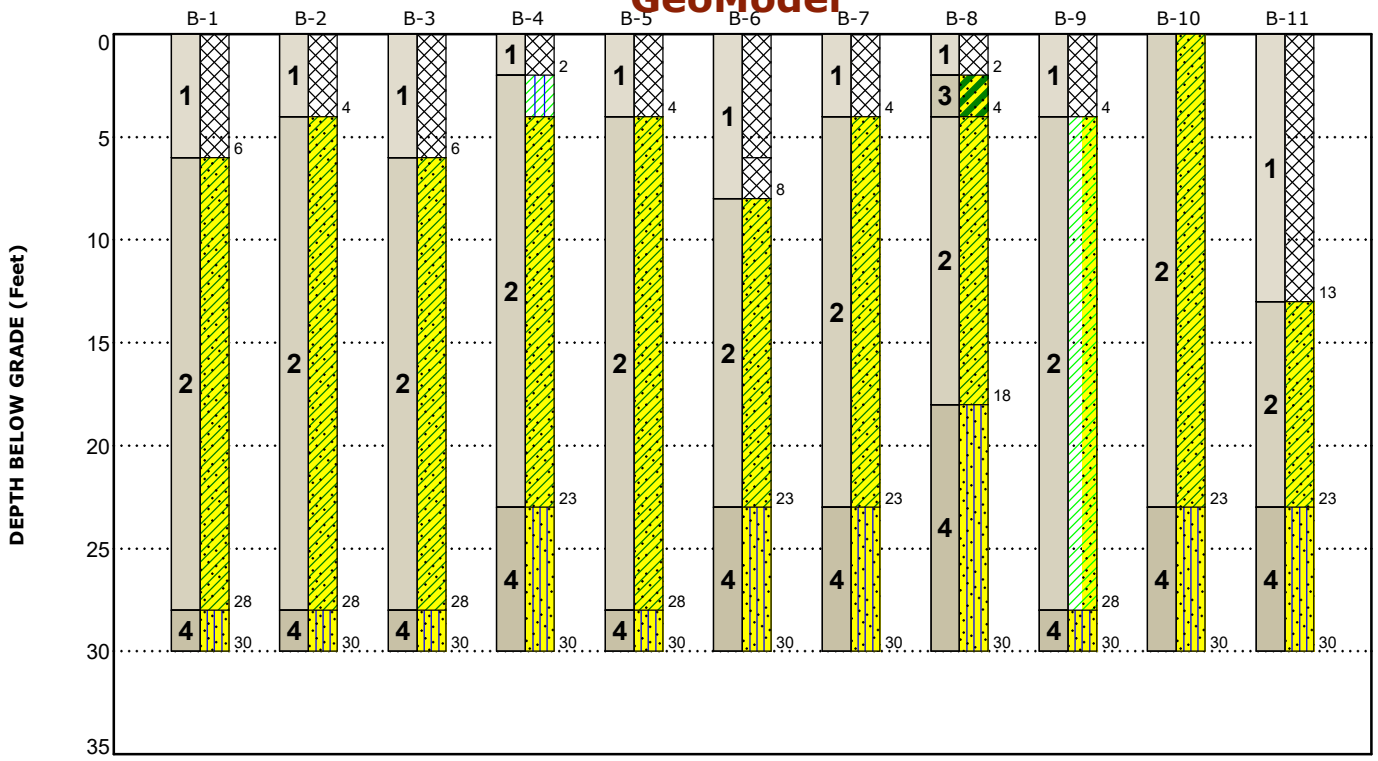
Contents:

GeoModel

Tomball ISD Intermediate School
Hufsmith-Khorville Road and Future Innovation Drive | Tomball, Texas
Terracon Project No. 92255559

11555 Clay Rd, Ste 100
Houston, TX

GeoModel



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	**Fill: Sandy Lean Clay and Sandy Fat Clay**	dark gray, gray, and tan, with sand pockets and calcareous and ferrous nodules
2	**Sandy Lean Clay, Silty Clay, and Sandy Silty Clay**	light gray, dark gray, gray, and tan, very soft to very stiff, with scattered roots, sand pockets, and calcareous and ferrous nodules
3	**Sandy Fat Clay**	light gray and tan, stiff, with sand pockets
4	**Silty Sand**	light gray and tan, medium dense to very dense, with clay pockets

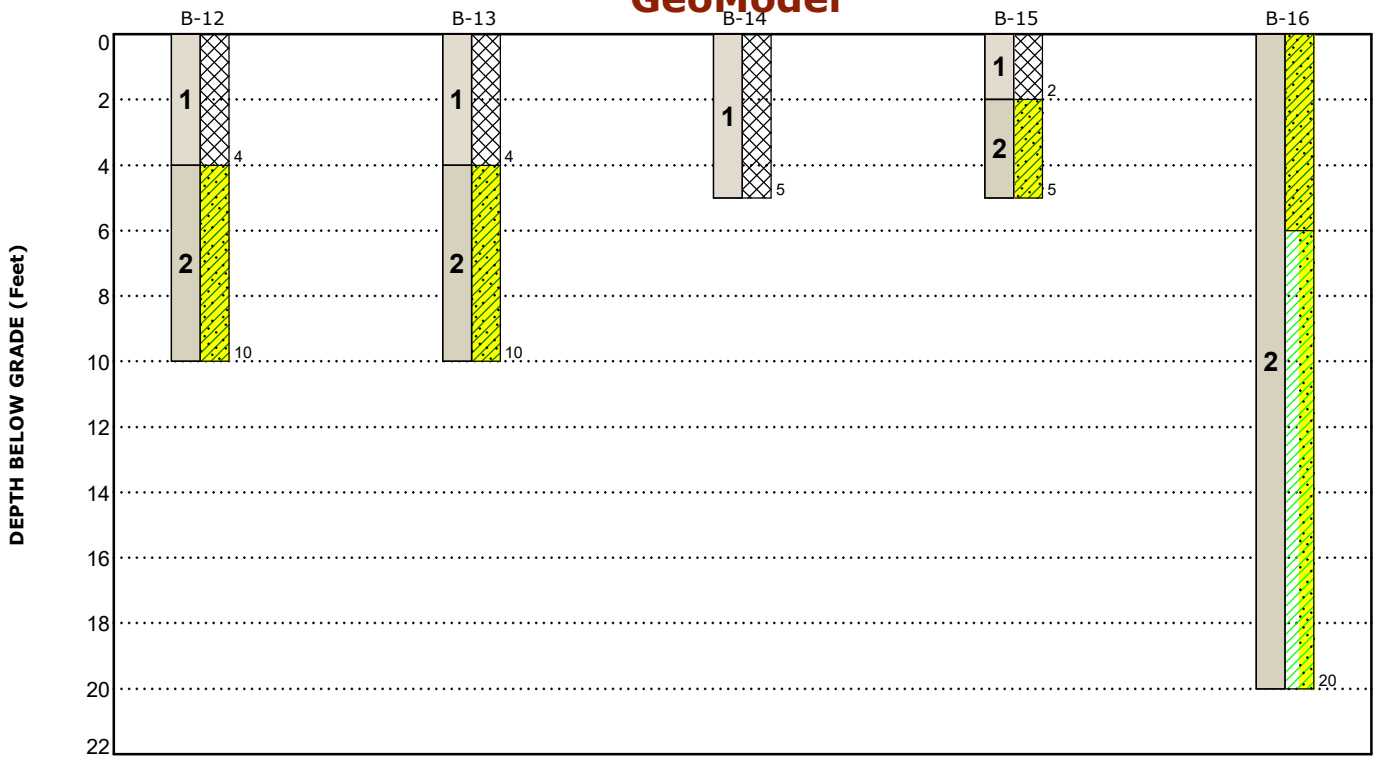
Legend

- Fill
- Sandy Lean Clay
- Silty Sand
- Silty Clay
- Sandy Fat Clay
- Lean Clay with Sand

NOTES:
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project.
Numbers adjacent to soil column indicate depth below ground surface.

11555 Clay Rd, Ste 100
Houston, TX

GeoModel



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	**Fill: Sandy Lean Clay and Sandy Fat Clay**	dark gray, gray, and tan, with sand pockets and calcareous and ferrous nodules
2	**Sandy Lean Clay, Silty Clay, and Sandy Silty Clay**	light gray, dark gray, gray, and tan, very soft to very stiff, with scattered roots, sand pockets, and calcareous and ferrous nodules
3	**Sandy Fat Clay**	light gray and tan, stiff, with sand pockets
4	**Silty Sand**	light gray and tan, medium dense to very dense, with clay pockets

Legend

Fill
Sandy Lean Clay
Lean Clay with Sand

NOTES:
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project.
Numbers adjacent to soil column indicate depth below ground surface.

Attachments

Exploration and Testing Procedures

Field Exploration

Planned Location	Number of Borings	Planned Boring Depth[1] (feet)
Proposed building area	11 (B-1 through B-11)	30
Proposed roadway areas	2 (B-12 and B-13)	10
Proposed driveway and parking lot areas	2 (B-14 and B-15)	5
Proposed playground and basketball court area	1 (B-16)	20

1. Below existing grade at the time of our field program.

Boring Layout and Elevations: We used handheld Global Positioning System (GPS) equipment to locate the approximate latitude and longitude of the borings with an accuracy of +/-25 feet. The boring depths were measured from the existing ground surface at the time of our field activities.

Subsurface Exploration Procedures: We advanced soil borings with an all-terrain vehicle (ATV) mounted drill rig using solid stem continuous flight augers. Samples were obtained at 2-foot intervals in the upper 12 feet of each boring and at intervals of 5 feet thereafter. Soil sampling was typically performed using open-tube and/or split-barrel sampling procedures.

Cohesive soil samples were generally recovered using open-tube samplers. Hand penetrometer tests were performed on samples of cohesive soils in the field to serve as a general measure of consistency.

Granular soils and soils for which good quality open-tube samples could not be recovered were sampled by means of the Standard Penetration Test (SPT). This test consists of measuring the number of blows (N) required for a 140-pound hammer free falling 30 inches to drive a standard split-spoon sampler 12 inches into the subsurface material after being seated six inches. This blow count or SPT "N" value is used to evaluate the stratum. A conventional safety hammer operated with a cathead and rope was used in advancing the split-spoon sampler.

The samples were placed in appropriate containers, taken to our soil laboratory for testing, and classified by a geotechnical engineer. In addition, we observed and recorded groundwater levels during drilling and sampling.

Our exploration team prepared field boring logs as part of standard drilling operations including sampling depths, penetration distances, and other relevant sampling information.

Field logs include visual classifications of materials observed during drilling, and our interpretation of subsurface conditions between samples. Final boring logs, prepared from field logs, represent an interpretation of the field logs by a geotechnical engineer and include modifications based on laboratory observation and tests on select samples.

Property Disturbance: We backfilled the borings with auger cuttings upon completion. Excess auger cuttings were dispersed in the general vicinity of the boring. Our services do not include repair of the site beyond backfilling our borings. Because backfill material often settles below the surface after a period, we recommend borings be periodically checked and backfilled, if necessary. We can provide this service for additional fees, at your request.

Laboratory Testing

The project engineer reviewed the field data and assigned laboratory tests to understand the engineering properties of the various soil strata, as necessary, for this project. Procedural standards noted below are for reference to methodology in general. In some cases, variations to methods were applied because of local practice or professional judgment. Standards noted below include reference to other, related standards. Such references are not necessarily applicable to describe the specific test performed.

- ASTM D2216 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- ASTM D7263 Standard Test Methods for Laboratory Determination of Density (Unit Weight) of Soil Specimens
- ASTM D4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- ASTM D1140 Standard Test Method for Determining the Amount of Materials Finer than No. 200 Sieve in Soils by Washing
- ASTM D2166/D2166M Standard Test Method for Unconfined Compressive Strength of Cohesive Soil
- ASTM C1580 Standard Test Method for Water-Soluble Sulfate in Soil

The laboratory testing program included observation of soil samples by an engineer. Based on the results of our field and laboratory programs, we described and classified the soil samples in accordance with the Unified Soil Classification System (USCS).

Samples not tested in the laboratory will be stored for a period of 30 days subsequent to submittal of this report and will be discarded after this period, unless we are notified otherwise.

Photography Log

Photo 1: Field exploration operations starting on March 9, 2026. Boring B-2. The Tomball ISD Innovation Center is featured in the background.

Photo 2: Field exploration operations starting on March 9, 2026. Boring B-2. The Tomball ISD Transportation Facility is featured in the background.

Site Location and Exploration Plans

Contents:

Site Location Plan
Exploration Plan

Note: All attachments are one page unless noted above.

Site Location

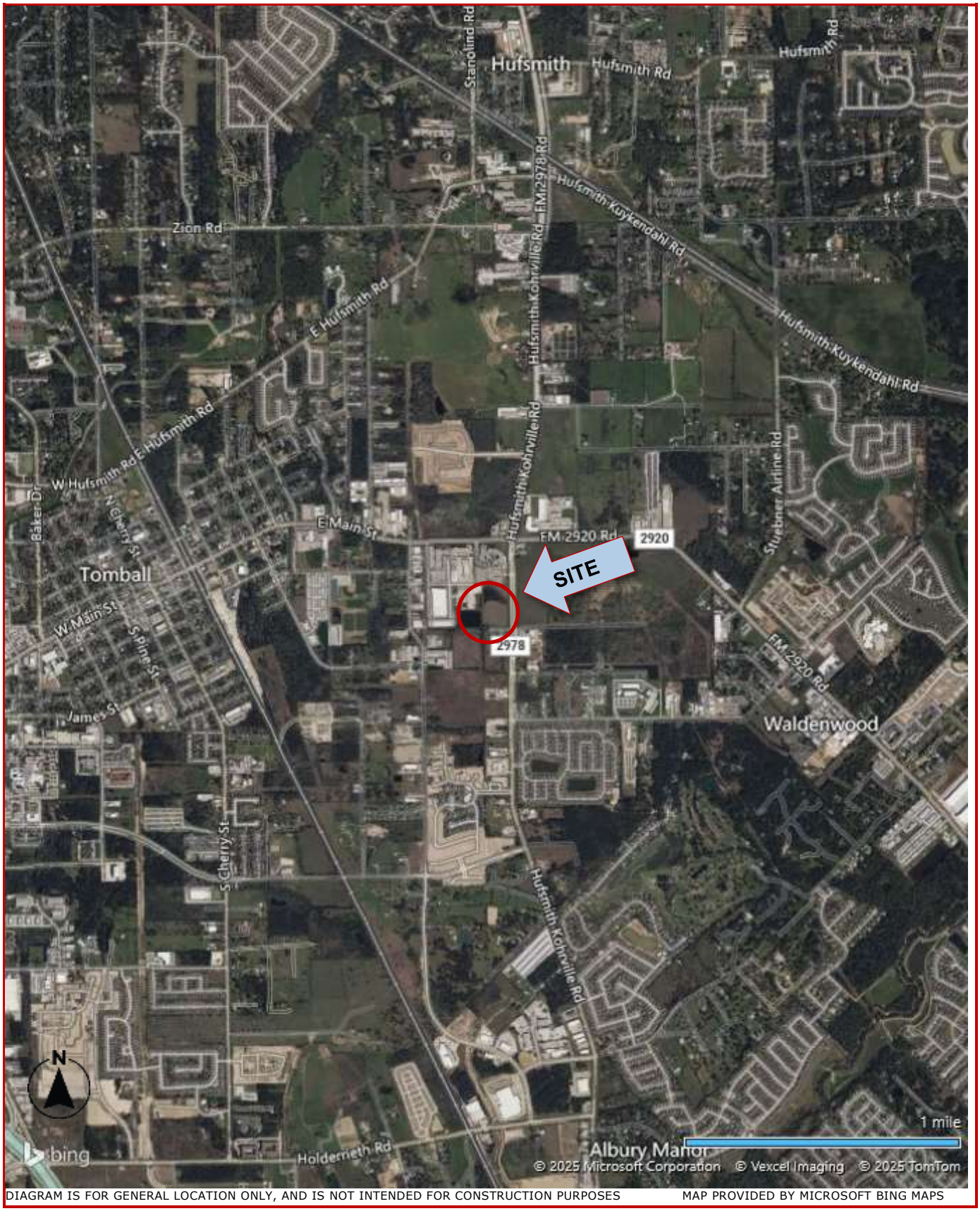


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES MAP PROVIDED BY MICROSOFT BING MAPS

Exploration Plan

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

Exploration and Laboratory Results

Contents:

Boring Logs (B-1 through B-16)

Note: All attachments are one page unless noted above.

Tomball ISD Intermediate School
Hufsmith-Khorville Road and Future Innovation Drive | Tomball, Texas
Terracon Project No. 92255559

Terracon
11555 Clay Rd, Ste 100
Houston, TX

Boring Log No. B-1

Location: See Exploration Plan

Latitude: 30.0965° Longitude: -95.5944°

Model Layer	Graphic Log	Depth (Ft.)	Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits: LL-PL-PI	Percent Fines
1		0.0	**FILL - SANDY LEAN CLAY (CL)**, tan, with calcareous and ferrous nodules				2.0 (HP)				10.3		41-16-25	
							2.5 (HP)							
				5			2.5 (HP)				16.0		35-14-21	
		6.0					2.5 (HP)							
2			**SANDY LEAN CLAY (CL)**, dark gray, very stiff, with sand pockets and ferrous nodules				2.5 (HP)	UC	2.65	6.2	19.3	111		
			- light gray and tan 10 to 28 feet	10			3.0 (HP)							
							4.5 (HP)							
				15										
							4.0 (HP)							
				20										
							2.5 (HP)							
				25										
		28.0												
4			**SILTY SAND (SM)**, tan, medium dense, with clay pockets				10-14-15 N=29							
		30.0		30										
			Boring Terminated at 30 Feet											

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
No free water observed.

Drill Rig
ATV

Hammer Type
Rope and Cathead

Driller
DAS

Notes

Advancement Method
Dry augered to 12 feet; wet rotary therafter.

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Logged by
D. Page

Boring Started
03-09-2026

Boring Completed
03-09-2026

Tomball ISD Intermediate School
Hufsmith-Khorville Road and Future Innovation Drive | Tomball, Texas
Terracon Project No. 92255559

Terracon
11555 Clay Rd, Ste 100
Houston, TX

Boring Log No. B-2

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 30.0964° Longitude: -95.5949° Depth (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits: LL-PL-PI	Percent Fines
1		**FILL - SANDY LEAN CLAY (CL)**, tan and dark gray, with calcareous nodules and sand pockets				2.5 (HP)							
						2.5 (HP)				13.6		25-14-11	
		4.0											
2		**SANDY LEAN CLAY (CL)**, dark gray, stiff to very stiff, with sand pockets and calcareous nodules - with scattered roots 4 to 6 feet	5			2.0 (HP)				12.8			63
						2.5 (HP)				12.8		39-19-20	
		- tan and light gray 8 to 28 feet				4.0 (HP)							
			10			4.5 (HP)	UC	2.68	6.1	19.5	111		
						4.5 (HP)							
			15										
						4.5 (HP)							
			20										
						4.0 (HP)							
			25										
		28.0											
4		**SILTY SAND (SM)**, tan, dense, with clay pockets				16-22-23 N=45							
		30.0	30										
		Boring Terminated at 30 Feet											

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
No free water observed.

Drill Rig
ATV

Hammer Type
Rope and Cathead

Driller
DAS

Notes

Advancement Method
Dry augered to 20 feet; wet rotary therafter.

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Logged by
D. Page

Boring Started
03-09-2026

Boring Completed
03-09-2026

Tomball ISD Intermediate School
Hufsmith-Khorville Road and Future Innovation Drive | Tomball, Texas
Terracon Project No. 92255559

Terracon
11555 Clay Rd, Ste 100
Houston, TX

Boring Log No. B-3

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 30.0959° Longitude: -95.5946° Depth (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits: LL-PL-PI	Percent Fines
1		**FILL - SANDY LEAN CLAY (CL)**, tan and dark gray, with calcareous nodules and sand pockets				2.5 (HP)						49-16-33	
		- dark gray and tan 2 to 4 feet				2.5 (HP)	UC	1.81	4.8	15.1	121		
			5			2.5 (HP)						25-14-11	
						3.0 (HP)							
						4.0 (HP)	UC	1.77	3.4	15.6	110		
			10			4.0 (HP)							
						4.5 (HP)							
2			15										
						4.5 (HP)							
			20										
						2.0 (HP)							
			25										
		28.0											
4		**SILTY SAND (SM)**, tan, dense, with clay pockets				15-21-21 N=42							
		30.0	30										
		Boring Terminated at 30 Feet											

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
No free water observed.

Drill Rig
ATV

Hammer Type
Rope and Cathead

Driller
DAS

Notes

Advancement Method
Dry augered to 20 feet; wet rotary therafter.

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Logged by
D. Page

Boring Started
03-09-2026

Boring Completed
03-09-2026

Tomball ISD Intermediate School
Hufsmith-Khorville Road and Future Innovation Drive | Tomball, Texas
Terracon Project No. 92255559

Terracon
11555 Clay Rd, Ste 100
Houston, TX

Boring Log No. B-4

Location: See Exploration Plan

Latitude: 30.0959° Longitude: -95.5951°

Model Layer	Graphic Log	Depth (Ft.)	Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits: LL-PL-PI	Percent Fines
1		2.0	**FILL - SANDY LEAN CLAY (CL)**, dark gray and tan, with calcareous nodules and sand pockets				2.0 (HP)							
		4.0	**SILTY CLAY (CL-ML)**, dark gray, medium stiff to very stiff, with scattered roots and sand pockets				1.5 (HP)						18-14-4	
2			**SANDY LEAN CLAY (CL)**, dark gray, medium stiff to very stiff, with sand pockets	5			2.0 (HP)	UC	0.98	6.3	14.6	118		58
			- light gray and tan 6 to 23 feet				1.5 (HP)						27-14-13	
							1.5 (HP)							
				10			3.5 (HP)	UC	2.19	4.3	17.2	110		
							3.5 (HP)							
				15										
							4.5 (HP)							
				20										
		23.0												
4			**SILTY SAND (SM)**, tan and light gray, medium dense to very dense, with clay pockets				35-40-15 N=55							
				25										
							14-10-9 N=19							
		30.0		30										
			Boring Terminated at 30 Feet											

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
No free water observed.

Drill Rig
ATV

Hammer Type
Rope and Cathead

Driller
DAS

Notes

Advancement Method
Dry augered to 30 feet.

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Logged by
D. Page

Boring Started
03-10-2026

Boring Completed
03-10-2026

Tomball ISD Intermediate School
Hufsmith-Khorville Road and Future Innovation Drive | Tomball, Texas
Terracon Project No. 92255559

Terracon
11555 Clay Rd, Ste 100
Houston, TX

Boring Log No. B-5

Location: See Exploration Plan
Latitude: 30.0962° Longitude: -95.5953°

Model Layer	Graphic Log	Depth (Ft.)	Material Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits: LL-PL-PI	Percent Fines
1		0.0	**FILL - SANDY LEAN CLAY (CL)**, tan and light gray, with sand pockets				2.0 (HP)						30-14-16	
							1.5 (HP)							
				5			1.5 (HP)				11.4		22-14-8	
							2.0 (HP)							
2			- light gray and tan 8 to 28 feet				2.5 (HP)	UC	0.95	7	14.7	114		61
				10			3.5 (HP)							
							3.5 (HP)							
				15										
							4.5 (HP)							
				20										
							4.0 (HP)							
				25										
4		28.0	**SILTY SAND (SM)**, tan, medium dense, with clay pockets				15-15-11 N=26							
		30.0	***Boring Terminated at 30 Feet***	30										

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
No free water observed.

Drill Rig
ATV

Hammer Type
Rope and Cathead

Driller
DAS

Notes

Advancement Method
Dry augered to 30 feet.

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Logged by
D. Page

Boring Started
03-10-2026

Boring Completed
03-10-2026

Tomball ISD Intermediate School
Hufsmith-Khorville Road and Future Innovation Drive | Tomball, Texas
Terracon Project No. 92255559

Terracon
11555 Clay Rd, Ste 100
Houston, TX

Boring Log No. B-6

Location: See Exploration Plan

Latitude: 30.0960° Longitude: -95.5956°

Model Layer	Graphic Log	Depth (Ft.)	Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits: LL-PL-PI	Percent Fines
1			**FILL - SANDY LEAN CLAY (CL)**, tan, with sand pockets				2.5 (HP)							
			- dark gray and tan 2 to 6 feet				2.5 (HP)				13.3		35-14-21	
				5			2.5 (HP)							
		6.0	**FILL - SANDY FAT CLAY (CH)**, dark gray and tan, with sand pockets				4.0 (HP)				16.2		54-18-36	
		8.0	**SANDY LEAN CLAY (CL)**, light gray and tan, very stiff, with sand pockets				4.5 (HP)							
				10			4.5 (HP)	UC	3.27	7	15.4	117		63
2							4.5 (HP)							
				15										
							4.5 (HP)							
				20										
		23.0	**SILTY SAND (SM)**, light gray and tan, dense, with clay pockets				20-20-23 N=43							
4				25										
		30.0					19-22-24 N=46							
			Boring Terminated at 30 Feet	30										

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
No free water observed.

Drill Rig
ATV

Hammer Type
Rope and Cathead

Driller
DAS

Notes

Advancement Method
Dry augered to 30 feet.

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Logged by
D. Page

Boring Started
03-10-2026

Boring Completed
03-10-2026

Tomball ISD Intermediate School
Hufsmith-Khorville Road and Future Innovation Drive | Tomball, Texas
Terracon Project No. 92255559

Terracon
11555 Clay Rd, Ste 100
Houston, TX

Boring Log No. B-7

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 30.0957° Longitude: -95.5953° Depth (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits: LL-PL-PI	Percent Fines
1		**FILL - SANDY LEAN CLAY (CL)**, tan and dark gray, with sand pockets				3.0 (HP)				15.1		25-14-11	
						2.5 (HP)	UC	2.32	6.5	11.1	127		
		4.0											
2		**SANDY LEAN CLAY (CL)**, gray and tan, stiff to very stiff, with sand pockets and calcareous nodules	5			3.0 (HP)				15.8		40-15-25	
						2.0 (HP)							
		- light gray and tan 8 to 23 feet				2.0 (HP)	UC	1.51	6.7	17.8	108		
			10			2.5 (HP)							
						4.0 (HP)							
			15										
						4.5 (HP)							
			20										
		23.0											
4		**SILTY SAND (SM)**, tan and light gray, medium dense to dense, with clay pockets				11-14-15 N=29							
			25										
						15-18-18 N=36							
		30.0	30										
		Boring Terminated at 30 Feet											

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
No free water observed.

Drill Rig
ATV

Hammer Type
Rope and Cathead

Driller
DAS

Notes

Advancement Method
Dry augered to 30 feet.

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Logged by
D. Page

Boring Started
03-10-2026

Boring Completed
03-10-2026

Tomball ISD Intermediate School
Hufsmith-Khorville Road and Future Innovation Drive | Tomball, Texas
Terracon Project No. 92255559

Terracon
11555 Clay Rd, Ste 100
Houston, TX

Boring Log No. B-8

Location: See Exploration Plan

Latitude: 30.0957° Longitude: -95.5949°

Model Layer	Graphic Log	Depth (Ft.)	Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits: LL-PL-PI	Percent Fines
1		2.0	**FILL - SANDY LEAN CLAY (CL)**, dark gray and tan, with calcareous nodules and sand pockets				2.5 (HP)							
3		4.0	**SANDY FAT CLAY (CH)**, light gray and tan, stiff, with sand pockets				3.0 (HP)				14.7		51-16-35	
2		18.0	**SANDY LEAN CLAY (CL)**, light gray and tan, very stiff, with sand pockets and calcareous and ferrous nodules	5			4.0 (HP)							
							4.0 (HP)				16.6		47-17-30	
							4.0 (HP)							
				10			4.5 (HP)	UC	3.08	4.6	15.7	116		
							4.5 (HP)							
4		30.0	**SILTY SAND (SM)**, tan and light gray, medium dense to very dense, with clay pockets	15										
				20			10-13-13 N=26							
				25			30-50/6"							
				30			14-16-20 N=36							
			Boring Terminated at 30 Feet											

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
No free water observed.

Drill Rig
ATV

Hammer Type
Rope and Cathead

Driller
DAS

Notes

Advancement Method
Dry augered to 20 feet; wet rotary therafter.

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Logged by
D. Page

Boring Started
03-09-2026

Boring Completed
03-09-2026

Tomball ISD Intermediate School
Hufsmith-Khorville Road and Future Innovation Drive | Tomball, Texas
Terracon Project No. 92255559

Terracon
11555 Clay Rd, Ste 100
Houston, TX

Boring Log No. B-9

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 30.0956° Longitude: -95.5962° Depth (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits: LL-PL-PI	Percent Fines
1		**FILL - SANDY LEAN CLAY (CL)**, dark gray and tan, with sand pockets				3.0 (HP)				12.9		40-18-22	
						3.0 (HP)							
		4.0				3.0 (HP)				15.4		30-15-15	
			5			3.5 (HP)							
						4.0 (HP)	UC	2.23	4.1	17.3	108		72
			10			4.5 (HP)							
2						4.5 (HP)							
			15										
						4.5 (HP)							
			20										
						4.5 (HP)							
			25										
		28.0											
4		**SILTY SAND (SM)**, tan and light gray, very dense, with clay pockets				20-25-28 N=53							
		30.0	30										
		Boring Terminated at 30 Feet											

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
No free water observed.

Drill Rig
ATV

Hammer Type
Rope and Cathead

Driller
DAS

Notes

Advancement Method
Dry augered to 30 feet.

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Logged by
D. Page

Boring Started
03-11-2026

Boring Completed
03-11-2026

Tomball ISD Intermediate School
Hufsmith-Khorville Road and Future Innovation Drive | Tomball, Texas
Terracon Project No. 92255559

Terracon
11555 Clay Rd, Ste 100
Houston, TX

Boring Log No. B-10

Location: See Exploration Plan
Latitude: 30.0955° Longitude: -95.5955°

Model Layer	Depth (Ft.)	Material Description	Water Level Observations	Sample Type	Field Test Results	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits: LL-PL-PI	Percent Fines
2	0	**SANDY LEAN CLAY (CL)**, dark gray, stiff to very stiff, with sand pockets			1.5 (HP)							
					1.5 (HP)				13.3		32-14-18	
		- light gray and tan 4 to 23 feet			2.5 (HP)							
	5				3.0 (HP)				16.0		49-17-32	
					3.5 (HP)							
	10				4.0 (HP)	UC	2.53	4.1	15.6	115		
					4.5 (HP)							
	15											
					4.0 (HP)							
	20											
4	23.0	**SILTY SAND (SM)**, light gray and tan, medium dense to dense, with clay pockets			13-15-15 N=30							
	25											
	30.0				11-13-11 N=24							
	30	***Boring Terminated at 30 Feet***										

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations

Caved in at 15 feet.

Notes

Advancement Method
Dry augered to 15 feet; wet rotary therafter.

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Drill Rig
ATV

Hammer Type
Rope and Cathead

Driller
DAS

Logged by
D. Page

Boring Started
03-10-2026

Boring Completed
03-10-2026

Tomball ISD Intermediate School
Hufsmith-Khorville Road and Future Innovation Drive | Tomball, Texas
Terracon Project No. 92255559

Terracon
11555 Clay Rd, Ste 100
Houston, TX

Boring Log No. B-11

Location: See Exploration Plan
Latitude: 30.0956° Longitude: -95.5962°

Model Layer	Graphic Log	Depth (Ft.)	Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits: LL-PL-PI	Percent Fines
1			**FILL - SANDY LEAN CLAY (CL)**, tan and gray, with sand pockets				3.5 (HP)				15.1		45-16-29	
							4.5 (HP)							
				5			4.5 (HP)				14.1		45-16-29	
							4.5 (HP)							
							4.0 (HP)	UC	1.62	8.5	12.6	121		
				10			4.0 (HP)							
		13.0												
2			**SANDY LEAN CLAY (CL)**, dark gray, very stiff, with sand pockets - with scattered roots 13 to 18 feet				3.5 (HP)							
				15										
			- light gray and tan 18 to 23 feet				3.5 (HP)							
		23.0		20										
4			**SILTY SAND (SM)**, tan and light gray, medium dense to dense, with clay pockets				13-16-17 N=33							
				25										
		30.0					11-11-14 N=25							
			Boring Terminated at 30 Feet	30										

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
No free water observed.

Drill Rig
ATV

Hammer Type
Rope and Cathead

Driller
DAS

Notes

Advancement Method
Dry augered to 10 feet.

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Logged by
D. Page

Boring Started
03-11-2026

Boring Completed
03-11-2026

Tomball ISD Intermediate School
Hufsmith-Khorville Road and Future Innovation Drive | Tomball, Texas
Terracon Project No. 92255559

Terracon
11555 Clay Rd, Ste 100
Houston, TX

Boring Log No. B-12

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 30.0972° Longitude: -95.5944° Depth (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits: LL-PL-PI	Percent Fines
1		**FILL - SANDY FAT CLAY (CH)**, dark gray and tan, with sand pockets				2.0 (HP)				15.2		51-17-34	
						1.5 (HP)							
		4.0	5			1.5 (HP)							
2		**SANDY LEAN CLAY (CL)**, dark gray, soft to stiff, with sand pockets - with scattered roots 4 to 6 feet				1.5 (HP)	UC	0.47	14.9	16.6	115		
		- light gray and tan below 8 feet				2.0 (HP)							
		10.0	10										
		Boring Terminated at 10 Feet											

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
No free water observed.

Drill Rig
ATV

Driller
DAS

Notes

Advancement Method
Dry augered to 10 feet.

Logged by
D. Page

Boring Started
03-09-2026

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Boring Completed
03-09-2026

Tomball ISD Intermediate School
Hufsmith-Khorville Road and Future Innovation Drive | Tomball, Texas
Terracon Project No. 92255559

Terracon
11555 Clay Rd, Ste 100
Houston, TX

Boring Log No. B-13

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 30.0970° Longitude: -95.5956° Depth (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits: LL-PL-PI	Percent Fines
1		**FILL - SANDY LEAN CLAY (CL)**, tan, with sand pockets				1.5 (HP)				18.1		40-17-23	
						1.5 (HP)							
		4.0											
2		**SANDY LEAN CLAY (CL)**, light gray and tan, very soft to stiff, with sand pockets and calcareous nodules	5			0.5 (HP)	UC	0.15	4	17.4	111		
						2.0 (HP)							
						2.0 (HP)							
		10.0	10										
		Boring Terminated at 10 Feet											

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
No free water observed.

Drill Rig
ATV

Driller
DAS

Notes

Advancement Method
Dry augered to 10 feet.

Logged by
D. Page

Boring Started
03-11-2026

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Boring Completed
03-11-2026

Tomball ISD Intermediate School
Hufsmith-Khorville Road and Future Innovation Drive | Tomball, Texas
Terracon Project No. 92255559

11555 Clay Rd, Ste 100
Houston, TX

Boring Log No. B-14

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 30.0962° Longitude: -95.5962° Depth (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits: LL-PL-PI	Percent Fines
1		**FILL - SANDY LEAN CLAY (CL)**, dark gray and tan, with sand pockets				4.0 (HP)				11.2		25-14-11	
						4.0 (HP)							
		5.0				4.5 (HP)							
		Boring Terminated at 5 Feet	5										

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
No free water observed.

Drill Rig
ATV

Driller
DAS

Notes

Advancement Method
Dry augered to 5 feet.

Logged by
D. Page

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Boring Started
03-11-2026

Boring Completed
03-11-2026

Tomball ISD Intermediate School
Hufsmith-Khorville Road and Future Innovation Drive | Tomball, Texas
Terracon Project No. 92255559

11555 Clay Rd, Ste 100
Houston, TX

Boring Log No. B-15

Model Layer	Graphic Log	Location: See Exploration Plan Latitude: 30.0967° Longitude: -95.5955° Depth (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits: LL-PL-PI	Percent Fines
1		**FILL - SANDY LEAN CLAY (CL)**, tan, with sand pockets 2.0				2.5 (HP)				16.3		40-17-23	
2		**SANDY LEAN CLAY (CL)**, dark gray and tan, stiff to very stiff, with sand pockets 5.0				2.5 (HP) 2.0 (HP)							
		Boring Terminated at 5 Feet	5										

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
No free water observed.

Drill Rig
ATV

Driller
DAS

Notes

Advancement Method
Dry augered to 5 feet.

Logged by
D. Page

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Boring Started
03-11-2026

Boring Completed
03-11-2026

Tomball ISD Intermediate School
Hufsmith-Khorville Road and Future Innovation Drive | Tomball, Texas
Terracon Project No. 92255559

Terracon
11555 Clay Rd, Ste 100
Houston, TX

Boring Log No. B-16

Location: See Exploration Plan

Latitude: 30.0953° Longitude: -95.5958°

Model Layer	Graphic Log	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits: LL-PL-PI	Percent Fines
		0			3.0 (HP)				10.2		23-14-9	
					4.0 (HP)							
					4.0 (HP)				14.2		38-16-22	
		5			4.0 (HP)							
					4.5 (HP)							
2		10			4.5 (HP)	UC	2.24	6	17.7	113		73
					4.5 (HP)							
		15										
					4.5 (HP)							
		20										

SANDY LEAN CLAY (CL), dark gray, very stiff, with sand pockets

- light gray and tan below 4 to 6 feet

6.0

LEAN CLAY WITH SAND (CL), light gray and tan, very stiff, with sand pockets

20.0

Boring Terminated at 20 Feet

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
No free water observed.

Drill Rig
ATV

Driller
DAS

Notes

Advancement Method
Dry augered to 20 feet.

Logged by
D. Page

Boring Started
03-11-2026

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Boring Completed
03-11-2026

Supporting Information

Contents:

General Notes
Unified Soil Classification System

Note: All attachments are one page unless noted above.

Terracon
11555 Clay Rd, Ste 100
Houston, TX

General Notes

Sampling	Water Level	Field Tests
Shelby Tube Standard Penetration Test	Water Initially Encountered Water Level After a Specified Period of Time Water Level After a Specified Period of Time Cave In Encountered Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.	N Standard Penetration Test Resistance (Blows/Ft.) (HP) Hand Penetrometer (T) Torvane (DCP) Dynamic Cone Penetrometer UC Unconfined Compressive Strength (PID) Photo-Ionization Detector (OVA) Organic Vapor Analyzer

Descriptive Soil Classification

Soil classification as noted on the soil boring logs is based Unified Soil Classification System. Where sufficient laboratory data exist to classify the soils consistent with ASTM D2487 "Classification of Soils for Engineering Purposes" this procedure is used. ASTM D2488 "Description and Identification of Soils (Visual-Manual Procedure)" is also used to classify the soils, particularly where insufficient laboratory data exist to classify the soils in accordance with ASTM D2487. In addition to USCS classification, coarse grained soils are classified on the basis of their in-place relative density, and fine-grained soils are classified on the basis of their consistency. See "Strength Terms" table below for details. The ASTM standards noted above are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgment.

Location And Elevation Notes

Exploration point locations as shown on the Exploration Plan and as noted on the soil boring logs in the form of Latitude and Longitude are approximate. See Exploration and Testing Procedures in the report for the methods used to locate the exploration points for this project. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

Strength Terms

Relative Density of Coarse-Grained Soils
(More than 50% retained on No. 200 sieve.)
Density determined by Standard Penetration Resistance

Relative Density	Standard Penetration or N-Value (Blows/Ft.)
Very Loose	0 - 3
Loose	4 - 9
Medium Dense	10 - 29
Dense	30 - 50
Very Dense	> 50

Consistency of Fine-Grained Soils
(50% or more passing the No. 200 sieve.)
Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance

Consistency	Unconfined Compressive Strength Qu (tsf)	Standard Penetration or N-Value (Blows/Ft.)
Very Soft	less than 0.25	0 - 1
Soft	0.25 to 0.50	2 - 4
Medium Stiff	0.50 to 1.00	4 - 8
Stiff	1.00 to 2.00	8 - 15
Very Stiff	2.00 to 4.00	15 - 30
Hard	> 4.00	> 30

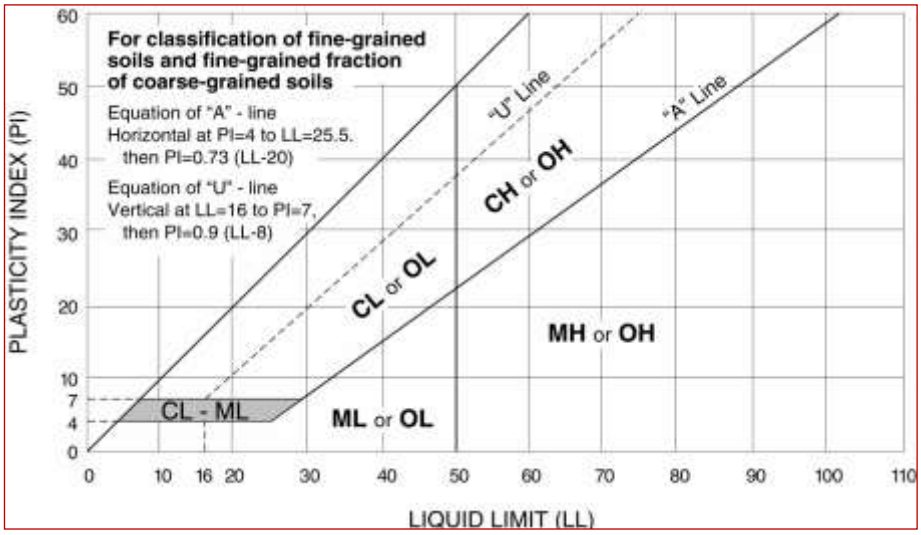
Relevance of Exploration and Laboratory Test Results

Exploration/field results and/or laboratory test data contained within this document are intended for application to the project as described in this document. Use of such exploration/field results and/or laboratory test data should not be used independently of this document.

Unified Soil Classification System

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]				Soil Classification	
				Group Symbol	Group Name [B]
Coarse-Grained Soils: More than 50% retained on No. 4 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	Cu≥4 and 1≤Cc≤3 [E]	GW	Well-graded gravel [F]
			Cu<4 and/or [Cc<1 or Cc>3.0] [E]	GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH	GM	Silty gravel [F, G, H]
			Fines classify as CL or CH	GC	Clayey gravel [F, G, H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	Cu≥6 and 1≤Cc≤3 [E]	SW	Well-graded sand [I]
			Cu<6 and/or [Cc<1 or Cc>3.0] [E]	SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH	SM	Silty sand [G, H, I]
			Fines classify as CL or CH	SC	Clayey sand [G, H, I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots above "A" line [J]	CL	Lean clay [K, L, M]
			PI < 4 or plots below "A" line [J]	ML	Silt [K, L, M]
		Organic:	$\frac{LL\ oven\ dried}{LL\ not\ dried} < 0.75$	OL	Organic clay [K, L, M, N]
					Organic silt [K, L, M, O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line	CH	Fat clay [K, L, M]
			PI plots below "A" line	MH	Elastic silt [K, L, M]
		Organic:	$\frac{LL\ oven\ dried}{LL\ not\ dried} < 0.75$	OH	Organic clay [K, L, M, P]
					Organic silt [K, L, M, Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor			PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve.
[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.
[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.
[E] $Cu = D_{60}/D_{10}$ $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$
[F] If soil contains ≥ 15% sand, add "with sand" to group name.
[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.
[H] If fines are organic, add "with organic fines" to group name.
[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.
[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.
[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.
[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.
[N] PI ≥ 4 and plots on or above "A" line.
[O] PI < 4 or plots below "A" line.
[P] PI plots on or above "A" line.
[Q] PI plots below "A" line.



SECTION 01 1100
SUMMARY OF WORK

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:
   1. The "Project" of which the "Work" of this Contract is a part, is titled Intermediate School Replacement for Tomball ISD and is composed of a new intermediate school and related site work located in Tomball, Texas.
   2. The "Work" of this Contract is titled Intermediate School Replacement and is defined in the Contract Documents to include, but not necessarily to be limited to:
      a. A new intermediate school campus, including all mechanical, electrical, plumbing, and general construction work.
   3. Related Work:
      a. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 01 of these Specifications.
      b. The work of other contracts is described in various contract documents prepared therefore, some of which are in the possession of the Owner and are available for inspection by interested parties.

B. Other Work:
   1. Owner (if required by Municipality, State or Federal requirements) shall provide evidence to the municipality permitting the project that an asbestos survey has been completed by a person licensed under the Texas Asbestos Health Protection Act to perform such a survey.
   2. The architect has no responsibility for the discovery, presence, handling, removal or disposal of or exposure of persons to hazardous materials or toxic substances in any form at the project site.
   3. The architect is not required to execute certifications that would require knowledge, services or responsibilities beyond the scope of the architectural service agreement.
   4. The architect assists the owner in the owner's responsibility to obtain applicable permits for demolition and construction.
   5. Contractor to review and familiarize themselves with owner's Asbestos survey and plan and shall inform every worker that they use on this project as to the availability of these surveys and plans prior to starting any work.

END OF SECTION

SECTION 01 1400
WORK RESTRICTIONS

PART 1 – GENERAL

1.01 DESCRIPTION

A. Work Included:
   1. Contractor shall comply with the following requirements concerning scope and work restrictions.
   2. If the Contractor believes that meeting the restrictions in this section would cause a delay to the intended schedule, they shall issue an RFI requesting specific modifications to that specific Work Restriction that would permit construction to continue without delay and indicating the reasons for the request. If construction proceeds without meeting any of the restriction requirements or obtaining approval for a modification of these requirements, the Contractor shall be responsible for all costs associated with removing and replacing all construction that occurred in violation of the Work Restrictions, if directed to by the Architect, without any increase in approved construction costs or schedule for the project.

B. Related Work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 01 of these Specifications.
   2. The work of other contracts is described in various contract documents prepared therefore, some of which are in the possession of the Owner and are available for inspection by interested parties.

C. Specific Project Restrictions:
   1. Contractor shall review phasing plan included in this project manual and provide pricing accordingly.
   2. Contractor shall be advised that the school will be operating during the duration of this project.
   3. Contractor shall coordinate with the Owner any activities which will disrupt normal school operations.
   4. Contractor shall schedule project to allow for a full season of grow-in on the athletic fields.
   5. All fire access roads, on and offsite, shall be complete prior to constructing vertical elements of the building.
   6. Before project completion and a certificate of occupancy is issued, Contractor shall provide fully established grass at locations including but not limited to all disturbed areas, under items that have been stored on site, construction trailers and storage units.
   7. Contractor may begin construction on or about _____ and shall be substantially complete on _____.

D. Project restrictions related to Quality Control
   1. The Contractor shall not be permitted to begin work on-site (other than job trailer installation and/or removal of on-site vegetation) until the Contractor has scheduled and hosted a “Foundation Pre-Construction” meeting (in person or on a conference call) with the Architect’s Construction Observer, a representative of the Special Inspection and Testing Agency (SITA), a representative of the Structural Engineer, the Superintendent of Construction, Contractor’s Project Manager, and all foremen for subcontractors with work related to the foundation.
   2. The Contractor shall not be permitted to continue work on-site (other than job trailer installation and/or removal of on-site vegetation) more than one week after the Foundation Pre-Construction meeting (or an alternative deadline if requested by the Contractor and approved by the Architect) unless:

a. The Contractor has obtained correspondence from the Geotechnical Engineer indicating that the Geotechnical Engineering firm has reviewed all relevant Construction Documents for conformance with their recommendations and indicated any portions of these documents which, in their opinion, do not conform with their recommendations. The term "relevant Construction Documents" shall include this Project Manual, all construction drawing sheets, any addenda issued before proposals are received, any addenda issued after proposals are received but before an Owner/Contractor Agreement is fully executed, and any changes in scope associated with a Request For Proposal (RFP) that is approved before construction begins.
b. The Contractor has obtained verification in writing from the Architect that the SITA has issued one or more acceptable statements indicating the SITA will be performing the scope of work for the SITA specified in Section 01 4533 and that the SITA as well as all SITA Staff that will be performing work on this project will meet the qualifications specified in Section 01 4533.
c. The Contractor has obtained verification in writing from the Mechanical and Electrical Engineers that the CxA has issued one or more acceptable statements indicating the CxA will be performing the scope of work for the CxA specified in Section 01 4533 and that the CxA as well as all CxA Staff that will be performing work on this project will meet the qualifications specified in Section 01 4533. This verification shall also confirm that the specified commissioning services on this project comply with the applicable version of the International Energy Conservation Code (IECC).
d. The Contractor has submitted to Tomball ISD, the Building Official, and the Architect a written "Acknowledgement of Contractor's Responsibilities Related to Code-Required Quality Control". (Refer to Section 01 4533 for suggested language.)
e. The Contractor has confirmed in writing to the Architect that the Contractor has scheduled and hosted a "Quality Control Pre-Construction Meeting", following the agenda in Section 01 4533, listing the names and project roles of all attendees.

3. The Contractor shall not be permitted to install any ACIP piles other than load test piles until verifying in writing that the Structural Engineer has either determined that the conditions encountered in the ACIP Pile Load Test report are generally consistent with those required for proposal purposes, or issued modifications to the ACIP pile design. Proposers shall assume for proposal purposes that they shall not be permitted to install piles other than load test ACIP piles until two (2) calendar weeks after the ACIP Pile load testing has been completed. It is hoped that this will take less time.
4. The Contractor shall not be permitted to apply for a Certificate of Occupancy until the Contractor has obtained a copy of each Final Report of Quality Control from every firm providing quality control services where required by the Final Report provisions of Section 01 4533 and, in addition, the Contractor has submitted to the AHJ the Final Report of Quality Control from the SITA, the Final Report of Quality Control from the CxA and the Final Report of Quality Control from the Code-Required Structural Observer. (The Contractor shall submit reports from the other quality control personnel if requested by the AHJ.)

E. Project Restrictions related to the General Framing Preconstruction Meeting
1. The Contractor shall not be permitted to install any portion of the superstructure until the Contractor has schedules and hosts a "General Framing Preconstruction Meeting" in which the following people attend: A representative of the Architect, a representative of the Structural Engineer, the SITA, the Superintendent of construction, the Contractor's Project Manager, and all foremen for subcontractors with work related to the framing.

END OF SECTION

SECTION 01 2100
ALLOWANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cash allowances.

B. Contingency allowance.

C. Payment and modification procedures relating to allowances.

1.02 CASH ALLOWANCES

A. Cash Allowances shall be included in the contract sum.

B. Contractor's costs for products, delivery, installation, labor, insurance, payroll, taxes, bonding, equipment rental, overhead and profit will not be included in Change Orders authorizing expenditure of funds from this Cash Allowance. These costs shall be included in base contract sum unless noted otherwise

C. Costs Not Included in Cash Allowances: Product handling at the site, including unloading, uncrating, and storage; protection of products from elements and from damage; and labor for installation and finishing. These costs shall be included in base contract sum unless noted otherwise.

D. Architect Responsibilities:
   1. Consult with Contractor for consideration and selection of products, and installers.
   2. Select products in consultation with Owner and transmit decision to Contractor.
   3. Prepare Change Order.

E. Contractor Responsibilities:
   1. Assist Architect in selection of products, suppliers, and installers.
   2. Obtain proposals from suppliers and installers and offer recommendations.
   3. On notification of which products have been selected, execute purchase agreement with designated supplier and installer.
   4. Arrange for and process shop drawings, product data, and samples. Arrange for delivery.

F. Differences in costs will be adjusted by Change Order.

G. At closeout of Contract, funds remaining in Cash Allowance will be credited to Owner by Change Order.

1.03 CONTINGENCY ALLOWANCE

A. Contingency Allowance shall be included in the contract sum.

B. Contractor's costs for products, delivery, installation, labor, insurance, payroll, taxes, bonding, equipment rental, overhead and profit will not be included in Change Orders authorizing expenditure of funds from this Contingency Allowance.

C. At closeout of Contract, funds remaining in Contingency Allowance will be credited to Owner by Change Order.

1.04 ALLOWANCES SCHEDULE

A. Section 01 5000 - Temporary Facilities and Control: Include the stipulated sum of $1,500 for purchase of project identification sign.

B. Owners Contingency Allowance: Include the stipulated sum/price of $3,000,000 for use upon Architect's and Owner's instructions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2200
UNIT PRICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Measurement and payment criteria applicable to Work performed under a unit price payment method.

1.02 COSTS INCLUDED

A. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

1.03 MEASUREMENT OF QUANTITIES

A. Measurement methods delineated in the individual specification sections complement the criteria of this section. In the event of conflict, the requirements of the individual specification section govern.

B. Take all measurements and compute quantities. Measurements and quantities will be verified by Architect.

C. Assist by providing necessary equipment, workers, and survey personnel as required.

D. Measurement by Weight: Concrete reinforcing steel, rolled or formed steel or other metal shapes will be measured by handbook weights. Welded assemblies will be measured by handbook or scale weight.

E. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.

F. Measurement by Area: Measured by square dimension using mean length and width or radius.

G. Linear Measurement: Measured by linear dimension, at the item centerline or mean chord.

1.04 PAYMENT

A. Payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities of Work that is incorporated in or made necessary by the Work and accepted by the Architect, multiplied by the unit price.

B. The undersigned further agrees that in case adjustments to the work or material is authorized from what is shown in the Contract the following unit prices will be used in adjusting the Contract Price. The Contract Price shall be subject to ncrease or decrease based upon the actually accepted quantities performed multiplied by the current contract unit prices. Work shall be in conformance with the Contract Documents. If unit price shall be used, then payment for all items will be on a unit price basis, unless listed otherwise in the Proposal Form. The unit price and payment made for each item listed shall constitute full compensation for furnishing all plant, labor, materials, and equipment, and performing any associated Contractor quality control, environmental protection, meeting safety requirements, tests and reports, and for performing all Work required for each of the unit price items. Contract unit price multiplied by agreed quantity is full compensation and includes Overhead, field overhead, and profit.

1.05 SCHEDULE OF UNIT PRICES

A. **UNIT PRICE 1: ELECTRICAL DUPLEX RECEPTACLE**

1. Provide unit price for a new 20A, 120V duplex electrical receptacle and cover plate, flush mounted in a CMU, metal stud, or demountable wall construction, circuited to an existing electrical panel within 150 feet of the outlet using a branch circuit consisting of 2 #10 AWG and 1 #10 AWG ground in 3/4 inch EMT conduit. All conduits to be concealed in wall construction. Unit price shall include a 20 amp circuit breaker to be installed in existing panel space.
   a. $_____ each

B. **UNIT PRICE 2: DATA DROP**

1. Provide unit price for a data drop, flush mounted in a CMU, metal stud or demountable wall construction., wired to an IDF/MDF Room. The data drop shall consist of a single gang wall box, cabling wiring device, cover plate, 3/4 inch conduit from outlet to above accessible ceiling, plenum-rated cabling routed above accessible ceiling to the nearest MDF or IDF location within 250 feet of the outlet. Termination and testing to be included in the unit price.
   a. $_____ each

C. **UNIT PRICE 3: VOICE DROP**

1. Provide unit price for a voice drop, flush mounted in a CMU, metal stud or demountable wall construction., wired to the telecommunications/MDF room. The voice drop shall consist of a single gang wall box, voice jack, cover plate, 3/4 inch conduit from outlet to above accessible ceiling, plenum-rated voice cable routed above accessible ceiling to telecommunication head end equipment. Termination and testing to be included in the unit price.
   a. $_____ each

D. **UNIT PRICE 4: 4 ½" THICK CONCRETE WALK PER SQUARE FOOT**

1. This unit cost shall establish the amount to the contract price for the Contractor to add or deduct 4 ½" thick concrete walk (minimum 100 SF) per Square Foot.
   a. $_____ each

E. **UNIT PRICE 5: 7" THICK CONCRETE DRIVE PER SQUARE FOOT**

1. This unit cost shall establish the amount to the contract price for the Contractor to add or deduct 7" thick concrete drive (minimum 100 SF) per Square Foot.
   a. $_____ each

F. **UNIT PRICE 6: LIFE SAFETY DEVICES (including all associated cabling and programming)**

1. This unit cost shall establish the amount to be added or deducted from the contract price for the Contractor to add /deduct Fire Alarm devices.
   a. Exterior Horn To Speaker $_____ each
   b. Interior Horn To Speaker $_____ each
   c. Interior Visual Strobe $_____ each
   d. Interior Speaker/Visual Strobe $_____ each
   e. Smoke Detector $_____ each
   f. Heat Detector $_____ each
   g. Manual Pull Station $_____ each
   h. Stopper 2 Pull Station Cover $_____ each
   i. Annunciator Panel $_____ each
   j. Duct Detector $_____ each
   k. Relay $_____ each
   l. Supervisory $_____ each
   m. Waterflow $_____ each

n. Amplifier $_____ each
o. Remote Power Supply $_____ each

G. **UNIT PRICE 7: 4" RESILIENT BASE 100 LINEAR FEET**
1. This unit cost shall establish the amount to be added or deducted to the contract price for the Contractor to properly remove existing base and install 4" resilient base.
a. $_____ each

H. **UNIT PRICE 8: GRAPHIC SIGNS**
1. This unit cost shall establish the amount to be added or deducted to the contract price for the Contractor to remove existing signage and install new as described below:
a. Sign Type A $_____ each
b. Sign Type B $_____ each
c. Sign Type C $_____ each
d. Sign Type D $_____ each
e. Sign Type E $_____ each
f. Sign Type F $_____ each
g. Max Occupancy Signage $_____ each
h. FDC Connection Signage $_____ each
i. Wayfinding Signage (2 lines text) $_____ each
j. Wayfinding Signage (3 lines text) $_____ each
k. Wayfinding Signage (4 lines text) $_____ each

I. **UNIT PRICE 9: EXIT SIGN**
1. This unit cost shall establish the amount to be added to the contract price to provide and install one (1) exit sign. Price shall include wiring to nearest available emergency circuit, up to 200 feet.
a. $_____ each

J. **UNIT PRICE 10: SECURITY FILM**
1. This unit cost shall establish the amount to be added to the contract price to provide and install security film on existing exterior glazing (minimum 200 square feet).
a. Armor Glass $_____ Square foot
b. Saint Gobain $_____ Square foot
c. 3M $_____ Square foot

K. **UNIT PRICE 11: TOPSOIL**
1. Each 1,000 square yards of prepared topsoil, 2" uniform depth.
a. $_____ Square yard

L. **UNIT PRICE 12: BACKFILL OFFSITE SOURCES**
1. Each cubic yard of backfilling, meeting fill requirements of construction documents, compacted in lifts as required by construction documents.
a. $_____ Cubic yard

M. **UNIT PRICE 13: BACKFILL ONSITE SOURCES**
1. Each cubic yard of backfilling, meeting fill requirements of construction documents, compacted in lifts as required by construction documents.
a. $_____ Cubic yard

N. **UNIT PRICE 14: CONCRETE POURED FROM TRUCK**
1. Each cubic yard structural concrete, off the truck, no pumping, placement, or finishing. as required by construction documents.
a. $_____ Cubic yard

O. **UNIT PRICE 15: CONCRETE PUMPED**
1. Each cubic yard structural concrete, as required by construction documents.
a. $_____ Cubic yard

P. **UNIT PRICE 16: CONCRETE GROUT PUMPED**
   1. Each cubic yard concrete grout, as required by construction documents.
      a. $_____ Cubic yard

Q. **UNIT PRICE 17: 24" DIAMETER AUGER CAST GROUT PILES**
   1. Each linear foot of 24" diameter auger cast grout piles complete including grout, accessories, & drilling.
      a. $_____ Linear Foot

R. **UNIT PRICE 18: CONCRETE MASONRY UNITS**
   1. Each unit of concrete masonry units, as required by construction documents.
      a. $_____ Units

S. **UNIT PRICE 19: REINFORCING STEEL, STRAIGHT OR BENT**
   1. Pound weight of reinforcing steel, straight or bent, as required by the Contract Documents.
      a. $_____ Pound

T. **UNIT PRICE 20: STRUCTURAL STEEL**
   1. Pound weight of structural steel as required by the Contract Documents.
      a. $_____ Ea.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2300
ALTERNATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Description of Alternates.

B. Procedures for pricing Alternates.

1.02 RELATED REQUIREMENTS

A. Document 00 1119 - Request for Competitive Sealed Proposals.

1.03 PROCEDURES

A. Proposers are required to submit alternate proposals to add work or to deduct work from the base proposal as described below. Failure to submit alternate amounts in spaces provided on proposal form is basis for disqualification of proposal.

B. The successful proposer shall not modify, withdraw or cancel any of the alternate proposals or any part thereof for 45 days after date of receipt of proposals, unless specifically noted otherwise.

C. Contractor shall be responsible for any changes in the work affected by acceptance of these alternates. Include within the alternative proposal prices all costs, including materials, installations, and fees.

D. Claims for additional dollars resulting from changes caused by the alternates will not be allowed.

E. Refer to the drawings and project manual for items of work affected by alternates.

F. Alternates will be exercised at the option of the Owner.

G. Coordinate related work and modify surrounding work as required to complete the Work, including changes under each alternate, when acceptance is designated in the Owner - Contractor Agreement.

1.04 ACCEPTANCE OF ALTERNATES

A. Indicate variation of proposal price for alternates described below and list on the proposal form or any supplement to it, which requests a 'difference' in proposal price by adding to or deducting from the base proposal price or by indicating "No Charge".

B. Indicating "No Bid" as an alternate is unacceptable and is reason for rejection of the proposal.

C. Alternates quoted on Bid / Proposal Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.

D. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

1.05 SCHEDULE OF ALTERNATES

A. Alternate Number 1A:
   1. Provide Rotary-Screw Water Chillers as manufactured by Carrier Corporation as specified and as shown on the drawings in lieu of Trane.

B. Alternate Number 1B:
   1. Provide Rotary-Screw Water Chillers as manufactured by JCI/York Corporation as specified and as shown on the drawings in lieu of Trane.

C. Alternate Number 2A:
   1. Provide Modular Central-Station Air-Handling Units as manufactured by Carrier as specified and as shown on the drawings in lieu of Trane.

D. Alternate Number 2B:
   1. Provide Modular Central-Station Air-Handling Units as manufactured by JCI/York as specified and as shown on the drawings in lieu of Trane.

E. Alternate Number 3:
   1. Provide new DDC building management system by Unify as specified and as shown on the drawings in lieu of Automated Logic (ALC).

F. Alternate Number 4:
   1. Provide PEX for domestic hot and cold water piping for all piping 1-1/2” and smaller as specified and as shown on the drawings in lieu of hard drawn copper.

G. Alternate Number 5:
   1. Provide striping within fire turning circle as specified and as shown on the AS drawing sheets.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 3000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General administrative requirements.

B. Electronic document submittal service.

C. Preconstruction meeting.

D. Schedule of Values.

E. Submittal Schedule.

F. Submittals for review and project closeout.

G. Number of copies of submittals.

H. Submittal procedures.

I. Progress Payments.

J. Contractor's Daily Field Report.

K. Request For Information.

1.02 RELATED REQUIREMENTS

A. Section 01 1100 - Summary of Work

B. Section 01 3216 - Construction Progress Schedule: Form, content, and administration of schedules.

C. Section 01 6000 - Product Requirements: General product requirements.

D. Section 01 7000 - Execution and Closeout Requirements: Additional coordination requirements.

E. Section 01 7800 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

1.03 GENERAL ADMINISTRATIVE REQUIREMENTS

A. The Notice to Proceed shall not be issued by the Architect until the Agreement (or Amendment, if Contractor is a Construction Manager at Risk) including final GMP and all exclusions or other post Proposal agreements, have been signed and approved as well as all required payment and performance bonds and insurance, and furnished to the Architect.

B. Comply with requirements of Section 01 7000 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.

C. Make the following types of submittals to Architect:
   1. Requests for Information (RFI).
   2. Requests for substitution.
   3. Shop drawings, product data, and samples.
   4. Test and inspection reports.
   5. Design data.
   6. Manufacturer's instructions and field reports.
   7. Applications for payment and change order requests.
   8. Progress schedules.
   9. Coordination drawings.
   10. Correction Punch List and Final Correction Punch List for Substantial Completion.
   11. Closeout submittals.
   12. Warranty request and corrective action descriptions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF) format, as appropriate to the document, and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
   1. This includes submittals for review, information, requests for information (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), field reports and meeting minutes, preliminary closeout for review, final project record documents closeout submittal and any other document any participant wishes to make part of the project record.
   2. Contractor and Architect are required to use this service at no cost to the Contractor.
   3. It is Contractor's responsibility to submit documents in allowable format.
   4. Subcontractors, suppliers, and Architect's consultants will be permitted to use the service at no charge.
   5. Users of the service need an email address, internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com), unless such software capability is provided by the service provider.
   6. Paper document transmittals will not be reviewed.
   7. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.

B. Submittal Service: The selected service is:
   1. Newforma Info Exchange: https://newforma.huckabee-inc.com/UserWeb
      a. Contractor will receive a username and password upon award of the project.

C. Training: External user tutorials are availible at www.newforma.com/external-users-tutorials. The awarded General Contractor will be required to become familiar with the program prior to Notice to Proceed being issued.

D. Training: External user tutorials are availible at https://learnacc.autodesk.com. The awarded General Contractor will be required to become familiar with the program prior to Notice to Proceed being issued.

E. Project Closeout: Architect will determine when to terminate the service for the project. Contractor is responsible for providing digital and hard copies of the final project record documents closeout submittal to the Owner. Should Owner forgo hard copies, Contractor shall submit a credit to the Owner.

3.02 PRECONSTRUCTION MEETINGS

A. A Kick-Off Pre-Construction meeting will be scheduled to be held upon notification by the Architect.
   1. Provide attendance by authorized representatives of the Contractor and major subcontractors.
   2. The Architect will advise other parties, including the Owner, and request their attendance.
   3. The Architect shall arrange, preside, and record the minutes of the pre-construction meeting.
   4. A pre-construction meeting agenda will be issued by the Architect at the meeting.
   5. Agenda items to be discussed include:
      a. Self introductions
      b. Design concept, scope, and objectives
      c. Communications
      d. Contractor’s responsibilities

e. Documentation and notification
f. Progress Meetings
g. Submittals/Substitutions
h. Project Administration
i. Project Closeout
j. Warranty Phase

B. Foundation Pre-Construction Meeting
1. Before beginning any work on-site (other than job trailer installation and/or removal of on-site vegetation) the Contractor shall schedule and host a “Foundation Pre-Construction” meeting (in person or on a conference call) with the Architect’s Construction Observer, a representative of the Special Inspection and Testing Agency (SITA), the Code-Required Structural Observer, a representative of the Structural Engineer, the Superintendent of Construction, Contractor’s Project Manager, and all foremen for subcontractors with work related to the foundation.

C. Quality Control Pre-Construction Meeting
1. Within one week after the “Foundation Pre-Construction Meeting”, the Contractor shall schedule and host a “Quality Control Pre-Construction Meeting” following the Agenda in Section 01 4533.

D. Framing Pre-Construction Meeting: The Contractor shall not be permitted to install any portion of the superstructure above the foundation until the Contractor has scheduled and held a "General Framing Preconstruction Meeting" in which the following people attend: A representative of the Architect, a representative of the Structural Engineer, the Special Inspection and Testing Agency (SITA), the Superintendent of construction, the Contractor's Project Manager, and all foremen for subcontractors with work related to the framing.

3.03 SCHEDULE OF VALUES AND DRAWDOWN SCHEDULE

A. Within twenty-one (21) calendar days following Notice to Proceed, the Contractor shall submit a Schedule of Values (using the breakdown of the Construction Schedule activities) for review by the Owner’s Representatives. The Schedule of Values will allocate a dollar value (cost) for each activity of the Construction Schedule. Each activity cost allocation shall include a labor, equipment and material cost and a pro rata contribution to overhead and profit. The sum of all activity costs shall be equal to the total Contract Sum. Each activity cost shall be coded with a cost code corresponding to the subcontractor responsible for the Work so that subtotals for each division of the Work can be prepared.

B. Within twenty-one (21) calendar days following Notice to Proceed, the Contractor shall submit a Drawdown Schedule showing anticipated monthly payments from the Owner for coordination of allocated funds for the Project.

C. Within thirty (30) calendar days following Notice to Proceed, the Contractor shall participate in a conference with the Owner’s Representatives to review, evaluate and approve the Schedule of Values and Drawdown Schedule. The approved Schedule of Values and Drawdown Schedule shall, in the best judgment of the Contractor, the Project Manager, and the Architect represent a fair, reasonable, and equitable dollar (cost) allocation for each activity on the Construction Schedule.

3.04 SUBMITTAL SCHEDULE

A. Within twenty-one (21) business days following the Notice to Proceed, the Contractor shall submit a Submittal Schedule for review by the Architect and Owner. This schedule shall coincide with the approved Construction Schedule accommodating the submittal review and material selection times as required by Architect, Owner or Owner’s Representatives. In the event a submittal schedule is not provided and approved by the Architect, Owner, or the Owner's Representative at the submission of the 2nd pay application, the 2nd pay application will be held until the submittal schedule is complete as noted above.

B. This schedule shall list all required submittals, product data, and samples for the project. Each item to be submitted shall include the date to be submitted, review time and the scheduled installation date. All submittals shall be listed and sequenced within the Submittal Schedule in accordance with the approved Construction Schedule.

C. The Architect and Owner will review the Submittal Schedule, provide revision comments and return it to the Contractor within fourteen (14) business days. If revisions are required, the Contractor shall then resubmit a revised Submittal Schedule to the Architect and Owner within fourteen (14) business days and thereafter until approved,

D. Submittals, product data and samples submitted out of sequence to the approved Submittal Schedule or Construction Schedule will be subject to return as unchecked and required to be resubmitted at a date coinciding with these schedules. The Submittal Schedule is advisory only and shall not relieve the Contractor of the responsibility for accomplishing the Work within each and every Contract required Milestone and Completion date. Omissions and errors in the approved Submittal Schedule shall not excuse the Contractor from providing required submittals, product data or samples, nor excuse the Contractor from meeting the Contract required Milestones and Completion date.

3.05 SUBMITTAL DEFINITIONS AND REQUIREMENTS

A. Shop Drawing
   1. Shop drawings, diagrams, schedules and other data specifically prepared for the work by the contractor, subcontractor, manufacturer, or supplier to illustrate some portion of the work.

B. Product Data
   1. Product data are illustrations, standard schedules, performance charts, instructions, and brochures, furnished by the contractor to illustrate materials or equipment to illustrate some portion of the work.

C. Sample
   1. Physical examples which illustrate materials for some portion of the work evaluated for product compliance.

D. Color Sample
   1. Physical examples which illustrate color or texture for use in color selection.

E. Submittal
   1. The submittal is the compilation of the shop drawing, product data, sample, color sample as requested by the specifications.

3.06 SUBMITTALS FOR REVIEW

A. Submittals to the Architect which are not listed below will not be reviewed by the Architect and will not be returned to the Contractor. Submittals required by specification section which are not listed in this section shall be reviewed by the Contractor.

B. The Architects review of the Contractors submittal shall be limited to examination of an initial submittal and one resubmittal. The Architect's review of additional submittals, beyond that of the initial and resubmittal, will be made only with prior written approval of the Owner after notification by the Architect.

C. Contractors review of submittals shall be consistent with A201 – General Conditions. Areas of deviation from the Contract Documents will be represented by revision clouds, Green in color, made by the General Contractor on the associated PDF document. In the event there are no clouded areas identified, it can be assumed that the associated submittal has been reviewed in full by the General Contractor and are deemed approved. No further review by the Architect is required.

D. Samples

1. Contractor shall submit all products which require a color selection. Contractor shall only submit actual product sample. Remainder of submittal shall be retained by contractor. Refer to color sample procedures below.
2. Provide sample identical to the precise article proposed to be provided. If actual sample is not provided for substitution review, submittal will be rejected.
3. Unless otherwise specified, submit one sample which will be retained by the Architect.
4. Samples will be reviewed only for aesthetic, color, or finish selection.

E. The Contractor may require his subcontractors to provide drawings, setting diagrams, and similar information to help coordinate the project, but such data shall remain between the Contractor and his subcontractors and will not be reviewed by the Architect.

F. Where required by specification sections, provide submittals to the Contractor for review and approval. Contractor shall maintain a copy of all submittals at the project site.

G. Fax submittals are not acceptable.

H. Upon request by the Architect, Contractor shall submit additional items as required.
1. Only the following listed items shall be submitted to the Architect for review:
    a. Section 03 1000 – Concrete Forming and Accessories
        1) Shop Drawings - Construction joint plan
    b. Section 03 2000 – Concrete Reinforcing
        1) Shop Drawings - Anchor bolt setting plan
        2) Shop Drawings - Grade beam, and slab reinforcing steel
    c. Section 03 3000 – Cast-In-Place Concrete
        1) Concrete Mix Designs
        2) Accessory products - Documentation indicated section 03 3000
    d. Section 04 0511 - Mortar and Masonry Grout
        1) All proposed mortar and grout mix designs
    e. Section 04 2000 - Unit Masonry
        1) Reinforcement Shop Drawings
    f. Section 04 7200 – Cast Stone Masonry
        1) Shop drawings with seal of professional engineer (Texas).
    g. Section 05 1200 - Structural Steel Framing
        1) Shop drawings.
    h. Section 05 1213 - Architecturally Exposed Structural Steel (AESS)
    i. Section 05 2100 – Steel Joist Framing
        1) Shop drawings.
    j. Section 05 3100 - Steel Decking
        1) Product Data - Deck type and finish
        2) Shop Drawings
    k. Section 05 4000 – Cold-Formed Metal Framing
        1) Shop drawings with seal of professional engineer (Texas).
    l. Section 05 5100 – Metal Stairs
        1) Shop drawings with seal of professional engineer (Texas).
    m. Section 05 7000 - Decorative Metal
        1) Product Data – all components required per spec section.
        2) Shop Drawings – all components required per spec section.
    n. Division 07 - Thermal and Moisture Protection
        1) Product Data – all components required per spec section.
        2) Shop Drawings – all components required per spec section.
    o. Division 08 - Openings
        1) Product Data – all components required per spec section.
        2) Shop Drawings – all components required per spec section.

p. Section 09 6566 – Resilient Athletic Flooring
    1) Product Data – all components required per spec section.
    2) Shop drawings – Court layouts/markings.
q. Section 09 7223 – Custom Digital Wall Covering
    1) Product Data – all components required per spec section.
    2) Shop Drawings – all components required per spec section.
r. Section 10 1400 – Signage
    1) Shop Drawings and sign copy layout
    2) Product Samples
s. Section 10 5100 – Lockers
    1) Product Data – all components required per spec section.
    2) Shop Drawings – all components required per spec section.
t. Section 10 7113.43 – Fixed Sun Screens
    1) Shop drawings with seal of professional engineer (Texas).
u. Section 10 7300 – Protective Coverings
    1) Shop drawings with seal of professional engineer (Texas).
v. Section 11 2336 – Commercial Appliances
    1) Product Data – all components required per spec section.
w. Section 11 3013 – Residential Appliances
    1) Product Data – all components required per spec section.
x. Section 11 4000 – Food Service Equipment
    1) Product Data – all components required per spec section.
    2) Shop Drawings – all components required per spec section.
    3) Parts Manuals - required for all equipment.
y. Section 11 6623 – Gymnasium Equipment
    1) Product Data – all components required per spec section.
z. Section 11 6833 – Athletic Field Equipment
    1) Product Data – all components required per spec section.
aa. Section 12 3200 - Manufactured Wood Casework
    1) Product Data – all components required per spec section.
    2) Shop Drawings – all components required per spec section.
bb. Section 12 3600 - Countertops
    1) Product Data – all components required per spec section.
    2) Shop Drawings – all components required per spec section.
cc. Section 12 3551 - Musical Instrument Cabinet System
    1) Product Data - all components required per spec section.
    2) Shop Drawings - all components required per spec section.
dd. Section 14 2400 – Hydraulic Elevators
    1) Product Data – all components required per spec section.
    2) Shop Drawings – all components required per spec section.
ee. Divisions 21, 22, 23, 26, 27, 28
    1) Product Data – all components required per spec section.
    2) Shop Drawings – all components required per spec section.
ff. Division 31 - Earthwork
    1) Product Data – all components required per spec section.
    2) Shop Drawings – all components required per spec section.
gg. Division 32 - Exterior Improvements
    1) Product Data – all components required per spec section.
    2) Shop Drawings – all components required per spec section.
hh. Division 33 - Utilities
    1) Product Data – all components required per spec section.

2) Shop Drawings – all components required per spec section.

2. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.
3. Samples will be reviewed only for aesthetic, color, or finish selection.
4. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7800 - Closeout Submittals.

3.07 SUBMITTALS FOR PROJECT CLOSEOUT

A. Within sixty (60) days following the Notice to Proceed, the Contractor shall submit a list of Expected Closeout Documents for review by the Architect. This list shall include project record documents, operation and maintenance data, warranties, bonds, contract forms, health/safe environment data, attic stock sign offs, Owner training, certifications and inspections, and other types as indicated. All items on the list shall be titled with spec section number and general description - Example: "09 3000 Tiling - 1 year warranty".

B. The Architect will review the list of Expected Closeout Documents, provide revision comments and return it to the Contractor within fourteen (14) business days. If revisions are required, the Contractor shall then resubmit a revised list to the Architect and Owner within fourteen (14) business days and thereafter until approved.

C. Contractor may submit Closeout Documents by Specification Division in full as scopes of work are completed.

D. Submit Correction Punch List for Substantial Completion.

E. Submit Final Correction Punch List for Substantial Completion.

F. Submit for Owner's benefit during and after project completion.

G. See Section’s 01 7000 and 01 7800 for additional details.

3.08 NUMBER OF COPIES OF SUBMITTALS

A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

B. Extra Copies at Project Closeout: See Section 01 7800.

C. Samples: Submit one sample as specified in individual specification sections which will be retained by Architect. All other samples required by the individual specification section shall be retained by the Contractor.
   1. After review, Contractor shall produce duplicates if needed for other purposes.
   2. The Architect’s sample will not be returned to Contractor.

3.09 SUBMITTAL PROCEDURES

A. General Requirements:
   1. Transmit using approved form.
   2. Acceptable Manufacturers
      a. Manufacturers submitted shall be as per the acceptable manufacturers listed in each specification. For additional manufacturers requiring approval, reference Section 01 6000 – Product Requirements.
   3. Sequentially identify each item. For revised submittals use original number and a sequential alphabetical suffix.
   4. Submittals shall be numbered as follows:
      a. Number shall be Architects project number followed by the appropriate specification section - consecutive submittal number for section.
      b. Example - 1234-01-01 Tiling 09 3000 - 5.
      c. When material is re-submitted for any reason, transmit under a new letter of transmittal and with a new transmittal number.

d. On re-submittals, cite the original submittal number for reference.
e. On at least the first page of each submittal, and elsewhere as required for positive identification, show the submittal number in which the item was included.
f. When multiple projects are administered under one contract, contractor shall submit separate submittals for each project. Failure to submit separately will result in a rejected submittal review.
g. Unless otherwise specified, make submittals in groups containing all associated items to assure that information is available for checking each item when it is received.
    1) Partial submittals may be rejected as not complying with the provisions of the Contract.
    2) The Contractor may be held liable for delays so occasioned.
    3) Multiple projects bid under a single prime shall package submittals separately for each project.

5. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
6. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
    a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
7. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
    a. Upload submittals in electronic form to Electronic Document Submittal Service website.
8. Schedule submittals to expedite the Project, and coordinate submission of related items.
    a. For each submittal for review, allow 14 days excluding delivery time to and from the Contractor.
9. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
10. Provide space for Contractor and Architect review stamps.
11. When revised for resubmission, identify all changes made since previous submission.
12. Revisions:
    a. Make revisions required by the Architect.
    b. If the Contractor considers any required revision to be a change, he shall so notify the Architect as provided for in the General Conditions.
    c. Make only those revisions directed or approved by the Architect.
    d. The contractor shall be responsible for delays caused by rejection of inadequate or incorrect submittals.
13. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
14. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
15. Submittals not requested will not be recognized or processed.

B. Shop Drawing Procedures:
1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
2. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

3.10 ELECTRONIC DRAWING FILE REQUEST

A. Upon Award of Contract:

1. At the pre-construction meeting, Awarded Prime Contractor shall bring the executed electronic file release form for the original contract documents. The agreement forms can be found at the end of this Section. Upon the Prime Contractor executing and submitting the agreement to the Architect, the Architect will provide the Contractor one (1) electronic copy of the Revit® BIM Model file(s) **at no charge** within five (5) working days. **Note that CAD files associated with the work can be accessed and exported from the model provided to the General Contractor through the use of Revit® software; therefore, individual CAD files will not be provided by the Architect or its consultants**. Files and Formats to be as follows
   a. Civil: Overall master file in AutoCAD format.
      1) Overall site plan with utility and grading information
      2) All details, detail annotation and references are omitted and not part of the AutoCAD file.
   b. Structural: BIM Model (Revit) and associated working plan views.
      1) Plan views contain overall and enlarged plan section view set up of foundation, second floor framing and roof framing only. All plan views contain grids, dimensions and general annotation.
      2) All details, detail annotation and references are omitted and not part of the model file.
   c. Architectural: BIM Model (Revit) and associated working plan views.
      1) Project Specific BIM Dataset will include information pertaining to the Architectural Building Information Model including model(s), schedules, views, sheets, and details.
      2) All “working” views will be omitted and Huckabee title blocks will be replaced with Huckabee CONTRACTOR Title Block
   d. Mechanical, Electrical and Plumbing: BIM Model (Revit) and associated working plan views.
      1) Plan views contain overall and enlarged section plan view set up of mechanical, electrical lighting, electrical power and plumbing plans only.
      2) All details, detail annotation and references are omitted and not part of the model file.
   e. Technology: BIM Model (Revit) and associated working plan views.
      1) Plan views contain overall and enlarged section plan view set up showing all device locations and general annotation.
      2) All details, detail annotation and references are omitted and not part of the model file.
      3) Electronic files for Technology drawings will only be released to the Prime Contractor but will require signatures from both the Prime Contractor and the Technology Subcontractor on an additional Technology/Security release form.
2. The Revit® file provided to the Awarded Prime Contractor is NOT FOR CONSTRUCTION PURPOSES, but for convenience only. This BIM Model will consist of the original model utilized for base bid. It is the responsibility of the Awarded Prime Contractor to coordinate all accepted alternates, addenda, Requests for Information, Proposal Requests and any other changes realized during construction. The Architect will not provide up-to-date drawings sets or updated BIM Models to the Awarded Prime Contractor unless otherwise stated within the Owner/Architect agreement. If “conformed” documents are required by the Owner/Architect agreement they will be provided in (PDF) Portable Document Format. Conformed Construction Documents are the Construction Documents modified to include any addenda issued during the bidding or negotiation process. The AIA does not use the terms “conform set” or “conformed set” in its documents.
3. TO THE EXTENT CONFORMED CONSTRUCTION DOCUMENTS ARE PROVIDED TO THE CONTRACTOR REGARDING THE PROJECT, THE FOLLOWING PROVISIONS SHALL APPLY:

a. The Conformed Construction Documents and related information contained therein, are provided for the Contractor's (CONTRACTOR) convenience only, and does not relieve the CONTRACTOR from the requirements of Contract Documents which were issued for bid including any addenda. Specifically, to the extent that any discrepancy or conflict exists between the Issue for Bid documents including any Addenda (collectively referred to as the "Bid and Addenda Documents") on the one hand, and the Conformed Construction Documents on the other, the Bid and Addenda Documents shall control unless otherwise specified in writing by the Architect. Field verification of existing and as-built conditions are required as part of the submittal process as specified in this Section 01 3000 Administrative Requirements and Section 01 7000 Execution and Closeout Requirements.
b. CONTRACTOR shall not to use such drawings, documents, or other data, in whole or in part, for any purpose or project other than the "PROJECT" in the preparation of shop drawings and other submittals.
c. CONTRACTOR acknowledges that such drawings, documents, and other data are subject to change or modification. CONTRACTOR shall be responsible for updating any drawings, documents or other data obtained prior to use by them for any purpose.
d. Any Conformed Construction Documents, including any drawings, documents, or other data related thereto, are provided, "AS IS" without representation or warranty by Architect, either express or implied.
e. CONTRACTOR acknowledges that Conformed Construction Documents are being provided by ARCHITECT as a courtesy to CONTRACTOR, at their specific request, and accordingly CONTRACTOR DOES HEREBY AGREE TO RELEASE, HOLD HARMLESS, DEFEND AND INDEMNIFY ARCHITECT AND THE TOMBALL ISD (OWNER), FROM ANY AND ALL CLAIMS, DEMANDS, OR CAUSES OF ACTION, WHICH CONTRACTOR, OR ANY THIRD PARTY, MAY HAVE BY REASON OF ANY INJURY OR DAMAGE SUSTAINED BY CONTRACTOR OR SUCH THIRD PARTTY ARISING OUT OF OR IN ANY WAY RELATED TO THE USE OF SUCH CONFORMED CONSTRUCTION DOCUMENTS.

3.11 PROGRESS PAYMENTS

A. The submission and approval of progress updates and the reports calculating the value of work done for any given pay period for each activity based on the percentage complete for that activity less the amount previously paid for past percentages complete and percent of retainage shall be an integral part and basic element of the application upon which Progress Payments shall be made pursuant to the provisions of the General Conditions and/or Supplementary Conditions. The Contractor shall be entitled to progress payments only as determined from the current updated and approved Construction Schedule. Contractor shall submit (3) three original sets for the first and final applications for payment, with all original signatures of AIA form G702 and G703 (form G702/CMa is not acceptable). All other payment applications shall be submitted electronically as described in paragraph 3.01 Electronic Document Submittal Service.
   1. The initial and subsequent cost reports which are developed from the schedule of values shall include the following activity information:
      a. Activity number and activity description.
      b. Percentage of value of work in place against Total Value.
      c. Total cost of each activity.
      d. Value of work in place this period.
      e. Value of work in place to date.
      f. Value of uncompleted work.
      g. Value of stored material not in place.
      h. The cost report will be submitted as supporting documentation to the Contractor's application for payment. The application for payment shall be submitted as required by the Contract Documents.

i. Identify scopes of work (campuses/buildings) when applicable with a clear and concise heading.
j. Separate scopes of work with the appropriate heading per the 2016 MasterFormat standard.
k. “Description of Work” shall be identified by specification number and heading per 2016 MasterFormat standard while separating the “Labor” and “Material” costs throughout each line item in the scope of Work.
l. Include all associated contingencies and allowances expenditures.
    1) All contingency and allowance expenditures shall be listed sequentially and follow the same guidelines as noted below. “Description of Work” shall reflect the pricing exercise and identify contingency or allowance.
    2) Reference the example AIA Document G703 found at the end of this Section.
m. In the event the Work is completed without the use of 100% of the the associated funds in the contract, column "H" or "Balance to Finish" shall represent the total dollar amount being credited back to the owner via AIA G701

3.12 CONTRACTOR’S DAILY FIELD REPORT

A. Daily reports shall be used to record a chronological, day-to-day account of the work force, the respective activities performed, the weather conditions, and any specific events that take place on the Project.

B. The Daily Report shall not be used as a communication tool. Any situations requiring specific action shall be brought to the attention of the appropriate party by means of written correspondence, memoranda, or meeting minutes.

C. Photographs shall be used with the Daily Report to clarify or confirm statements and concerns.

D. The Contractor shall produce a Daily Report including the following information:
    1. Date.
    2. Weather, temperature, wind, and precipitation.
    3. Number of workers on site, listed by Subcontractor and Trade.
    4. Material and equipment deliveries.
    5. Construction quantities placed.
    6. General description of the Work accomplished.
    7. Specific problems encountered.
    8. Meetings held.
    9. List of visitors to the site and their companies.
    10. Construction photographs.

E. NOTE: Provide Owner with copies of signed Daily Report at weekly progress meetings.

3.13 REQUEST FOR INFORMATION

A. Contract document interpretations or clarifications shall be submitted by the Contractor to the Architect in the form of a written request for information (RFI).

B. RFIs shall be numbered sequentially and shall include only one question or related questions per RFI. If the Contractor’s question or request for interpretation is already clearly defined or discernible in the contract documents, the RFI may be returned unanswered and the Architect may be entitled to additional compensation (from the Contractor) for review time.

C. If the Contractor believes there may be additional contract cost or time incurred, it shall be stated in the RFI. If additional contract cost or time is required based on the RFI, the Architect will issue appropriate documentation for the proposed change. All changes in work shall be accomplished by approved change order only.

D. The Architect will respond to the RFI in a reasonable and timely manner, within approximately seven (7) business days from the date the RFI is received and stamped by the Architect's office. No extension of contract cost or time will be allowed due to a delayed RFI submittal or the response to an RFI.

3.14 DEVELOPMENT OF ADVERSE WEATHER DATA

A. Unless adverse weather data is defined elsewhere in the contract for construction, provide as follows;

B. Collection of Adverse Weather Data
   1. Weather data obtained from the National Oceanic and Atmospheric Administration (NOAA) shall form the baseline for estimating anticipated delays and project durations and determining the occurrence of unusually severe weather. Data shall be collected and compiled as follows:
      a. Contractor shall compile the number of days per month that the anticipated weather is expected to be adverse by analysis of NOAA. The last 5 years of consecutive data shall be used to establish the baseline of rain days per month associated with the project schedule duration. However, in the absence of 5 years of data, a shorter period may be used.
      b. The compiled data shall be submitted with the Contractors Construction Schedule for documenting future weather events.
   2. Adverse Weather is defined as the occurrence of one or more of the following conditions within a twenty-four (24) hour day that prevents the Critical Path of construction activity exposed to weather conditions or access to the site:
      a. Precipitation (rain, snow, or ice) in excess of one-quarter inch (0.25") liquid measure.
      b. Temperatures that do not rise above that required for the day's construction activity, if such temperature requirement is specified or accepted as standard industry practice.
      c. Sustained wind in excess of twenty-five (25) m.p.h.
      d. Contractor shall take into account that certain construction activities are more affected by adverse weather and seasonal conditions than other activities, and that "dry-out" or "mud" days are not eligible to be counted as Weather Delay Day until the standard baseline is exceeded. Hence, Contractor should allow for an appropriate number of additional days associated with the Standard Baseline days in which such applicable construction activities are expected to be prevented and suspended.
   3. A Weather Delay Day may be counted if adverse weather prevents work on the project for fifty percent (50%) or more of the contractor's scheduled work day and Critical Path construction activities were included in the day's schedule, including a weekend day or holiday if Contractor has scheduled construction activity that day.

C. Submission for Time Extension
   1. Although the contractor is required to document the occurrence and effect of adverse weather on the work, it does not relieve the Contractor/Architect of its responsibility to investigate and determine if an excusable delay has occurred.
   2. The schedule of anticipated adverse weather delays included in the contract is established in work days. Similarly, actual weather data should be collected and recorded on a work day basis. Monthly summaries should be maintained indicating actual adverse weather conditions and the impact on work activities.
   3. To determine if any particular month experienced unusually severe weather, the number of actual adverse delay days is compared to that as provided by the NOAA database. If the number of actual delay days is greater than that in the contract the contractor has experienced unusually severe weather.

4. THE DETERMINATION THAT UNUSUALLY SEVERE WEATHER OCCURRED DOES NOT AUTOMATICALLY MEAN THAT THE CONTRACTOR RECEIVES A TIME EXTENSION FOR THE DIFFERENCE OF DAYS BETWEEN THE ANTICIPATED AND ACTUAL ADVERSE WEATHER DELAY DAYS. Further analysis is necessary to determine if the unusually severe weather delayed work activities critical to contract completion. The contractor's progress schedule must be evaluated to make this determination. If it is found that unusually severe weather delayed the contract, a contract modification shall be issued pursuant to Gov. Code 2269
5. Claims for increase in the contract time shall set forth in writing the detail noting the circumstances that form the basis for the claim, the date upon which each cause of delay began to affect the progress of the work, the date upon which each cause of delay ceased to affect the progress of the work and the number of days increase in the contract time claimed as a consequence of each such cause of delay. The Contractor shall bear the entire economic risk of all weather delays and disruptions, and shall not be entitled to any increase in the Contract Price by reason of such delays or disruptions. Requests for an extension of time pursuant to this Subparagraph shall be submitted to the Architect in writing not later than the fifteenth (15th) day of the month following the month during which the delays or disruptions occurred, and shall include documentation demonstrating the nature and duration of the delays or disruptions. Where appropriate, a revised construction schedule indicating all the activities affected by the circumstances shall be included with the documentation.

END OF SECTION

Huckabee

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ELECTRONIC DOCUMENT RELEASE FORM

Date	

Transmitting Party	Huckabee
Address	
Phone	888.801.6673
Representative	

Receiving Party	
Address	
Phone	
Representative	

Project Name	
Project Number	

This Agreement is made in reference to the electronic drawing plan files for {Recipient} with {Receiving Firm.}

At your request, Huckabee will provide electronic files for your convenience and use in the preparation services performed related to the {Project Name}, subject to the following terms and conditions:

Data contained on these electronic files is part of Huckabee's instruments of service and is confidential and shall not be used by you or anyone else receiving this data through or from you for any purposes other than as a convenience in the preparation of drawings related to your scope of work. These electronic files are not contract documents or accurate record drawings, and significant difference may exist between these electronic files and the actual physical conditions of the facility and/or property.

You agree to assume all liability and risks associated therewith any use of these electronic files in the preparation of contract documents for the new project scope. With the use of these electronic files you agree to the fullest extent permitted by law to hold harmless and indemnify Huckabee and its consultants from and against all claims, liabilities, losses, damages, and costs, including but not limited to attorney's fees, arising there from or in connection therewith. Under no circumstances shall delivery of the electronic files for use by you be deemed a sale by Huckabee, and Huckabee makes no warranties, either expressed or implied for any particular purpose.

Copyrights are a form of intellectual property protection provided by federal law. Huckabee expressly retains ownership of all reports, drawings, plans, specifications, electronic files (including CAD/Revit/ BIM models and files), field data, notes and other documents and instruments prepared by Huckabee and/or our Consultant(s) as instruments of service. Huckabee and applicable Consultants shall retain all common law, statutory and other reserved rights, including, without limitation, all copyrights thereto.

We do not mark all documents or digital files with copyright and we are not required to. You are hereby notified that our work (including digital) is protected by copyright, inherently identifying Huckabee as copyright owner and represented by publication date occurrence. This notice clarifies our work shall not be infringed upon by proper notice, disallowing any defendant to claim “innocent infringement.”

File Type:

- ☐ Construction
- ☐ Clash Detection
- ☐ Timeline Simulation
- ☐ Logistics Planning
- ☐ Quantity Extraction / Cost Estimating
- ☐ Shop Drawings
- ☐ Bidding
- ☐ Other

File Format:

- ☐ Revit (.rvt) File Name
- ☐ Navisworks (.nwc/.nwd/.nwf) File Name
- ☐ AutoCAD (.dwg) File Name File Name
- ☐ IFC (enter format type) File Name
- ☐ Design Review (.dwf) File Name
- ☐ Other

Accepted:

_____

Signature and Printed Name of Transmitting Party DATE

_____

Signature and Printed Name of Receiving Party DATE

SECTION 01 3216
CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preliminary schedule.

B. Construction progress schedule, bar chart type.

1.02 RELATED SECTIONS

A. Section 01 1000 - Summary of Work.

1.03 REFERENCE STANDARDS

A. AGC (CPSM) - Construction Planning and Scheduling Manual; 2004.

B. M-H (CPM) - CPM in Construction Management - Project Management with CPM; 2016, with Addendum (2021).

1.04 SUBMITTALS

A. Within 14 days after date established in Notice to Proceed, submit preliminary schedule defining planned operations.

B. If preliminary schedule requires revision after review, submit revised schedule within 7 days.

C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
   1. Include written certification that major Subcontractors have reviewed and accepted proposed schedule.

D. Within 10 days after joint review, submit complete schedule.

E. Submit updated schedule with each Application for Payment.

F. Submit the number of opaque reproductions that Contractor requires, plus two copies that will be retained by Architect.

G. Submit under transmittal letter form specified in Section 01 3000 - Administrative Requirements

H. Approval by the Owner and Owner's Representatives of the Contractor's Construction Schedule is advisory only and shall not relieve the Contractor of the responsibility for accomplishing the Work within each and every Contract-required Milestone and Completion date. Omissions and errors in the approved Construction Schedule shall not excuse performance, which is not in compliance with the Contract. Approval by the Owner and Owner's Representatives in no way makes the Owner or Owner's Representatives an insurer of the Construction Schedule's success or liable for time or cost overruns flowing from its shortcomings. The Owner hereby disclaims any obligation or liability by reason of Owner or Owner's Representatives approval of or acquiescence to the Construction Schedule.

I. It is to be expressly understood and agreed by the Contractor that the schedule is an estimate to be revised from time to time as progress proceeds, and that the Owner does not guarantee that Contractor can start work activities on the early or late start dates or complete work activities on the early finish or late finish date shown in the schedule, or as same may be updated or revised; nor does the Owner or Owner's Representative guarantee that Contractor can proceed at all times in the sequence established by said schedule. If Contractor's schedule indicates that Owner or a separate contractor is to perform an activity by a specific date, or within a certain duration, Owner or any separate contractor under contract with Owner shall not be bound to said date or duration unless Owner expressly and specifically agrees, in writing, to same; the Owner's and / or the Owner's Representative's overall review and approval or acceptance of the schedule does not constitute an agreement to specific dates, duration or sequences for activities of the Owner or any separate contractor.

1.05 QUALITY ASSURANCE

A. Scheduler: Contractor's personnel or specialist Consultant specializing in CPM scheduling with three years minimum experience in scheduling construction work of a complexity comparable to this Project, and having use of computer facilities capable of delivering a detailed graphic printout within 48 hours of request.

B. Contractor's Administrative Personnel: three years minimum experience in using and monitoring CPM schedules on comparable projects.

1.06 SCHEDULE FORMAT

A. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.

B. Diagram Sheet Size: Width required.

C. Sheet Size: Multiples of 8-1/2 x 11 inches.

D. Scale and Spacing: To allow for notations and revisions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRELIMINARY SCHEDULE

A. Prepare preliminary schedule in the form of a horizontal bar chart.

3.02 CONTENT

A. Critical Path Method (CPM) to show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.

B. Identify each item by specification section number.

C. Identify work of phases, separate stages or proposed occupancies and other logically grouped activities.

D. Provide sub-schedules for each stage of Work identified in Section 01 1000 - Summary.

E. Include contract milestone dates and completion dates as specified in the contract.

F. Provide sub-schedules to define critical portions of the entire schedule.

G. Include conferences and meetings in schedule.

H. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.

I. Provide separate schedule of submittal dates for shop drawings, product data, and samples, owner-furnished products, products identified under Allowances, and dates reviewed submittals will be required from Architect. Indicate decision dates for selection of finishes.

J. Indicate delivery dates for owner-furnished products and Owner furniture or equipment scheduled for salvage and/or relocation in project.

K. Indicate testing of materials.

L. Indicate activity periods for punch list.

M. Indicate the work to be performed during the facility's scheduled holidays, weekends, or summer recess periods.

N. Coordinate content with schedule of values specified in Section 01 3000.

O. Provide legend for symbols and abbreviations used.

3.03 BAR CHARTS

A. Include a separate bar for each major portion of Work or operation.

B. Identify the first work day of each week.

C. The schedule diagram shall be a time-scaled drawing.

D. The Construction Schedule Detailed Reports, initial submittal and subsequent updates or revisions, shall indicate each of the following:
   1. Description of activity including activity number/numbers.
   2. Estimated duration time or remaining duration for each activity.
   3. Early start date for each activity.
   4. Late start date for each activity.
   5. Early finish date for each activity.
   6. Late finish date for each activity.
   7. Float available for each path of activities containing float.
   8. Actual start date for each activity begun.
   9. Actual finish date for each activity completed.
   10. Identification of all critical path activities in the mathematical analysis.
   11. The critical path for the Project, with said path of activities being clearly and easily recognizable on the time-scaled graphic diagram, and the relationship between all non-critical activities and activities on the critical path shall be clearly shown on the graphic diagram.
   12. The dollar value of each activity in relation to the schedule of values. This may be shown on a separate cost report.
   13. The responsibility code for the Contractor or Subcontractor performing each activity or portion thereof.
   14. The percentage complete of each activity in progress or complete.

3.04 SCHEDULE OF OFF-SITE ACTIVITIES

A. The Contractor shall include in his Construction Schedule all procurement related activities which lead to the delivery of materials to the site in a timely manner. Upon written approval by the Project Manager, these activities may be submitted as a separate Off-Site Activities Schedule, properly correlated to the Construction Schedule. The schedule of off-site activities shall include, but is not limited to, the following:
   1. Dates for submittals, ordering, manufacturing or fabricating, and delivery of equipment and materials. Long lead items requiring more than one month between ordering and delivery to site shall be clearly noted;
   2. All significant activities to be performed by the Contractor during the fabrication and erection/installation in a Contractor's plant or on a job site, including materials/equipment purchasing, delivery; and
   3. Contractor's drawings and submittals to be prepared and submitted to the architect.

B. The Contractor shall be solely responsible for expediting the delivery of all material to be furnished by him so that the construction progress shall be maintained according to the current schedule for the Work.

C. The Owner's Representatives shall be advised, in writing, by the Contractor whenever it is anticipated by the Contractor that the delivery date of any material and/or equipment furnished by the Contractor for installation will be later than the delivery date shown on the schedule, subject to schedule updates.

D. Submittals, equipment orders and similar items are to be treated as schedule activities, and shall be given appropriate activity numbers.

3.05 FLOAT TIME

A. Float or slack time is defined as the amount of time between the earliest start date and the latest start date or between the earliest finish date and the latest finish date of an activity or a chain of activities on the Construction Schedule. Float or slack 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's Representatives 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.

B. Extensions of time for performance as described in the Contract Documents will be granted only to the extent that time adjustment for the activity or activities affected by any condition or event which entitles the Contractor to a time extension exceed the total float or slack along the path of activities affected at the time of Notice to Proceed of a Change Order or the commencement of any delay or condition for which an adjustment is warranted under the Contract Document.

3.06 SCHEDULE UPDATES AND REPORTS

A. Every month, in conjunction with the monthly application for payment, the Contractor shall submit an updated graphic diagram and an updated detailed schedule report from the Construction Schedule and updated Record Documents. Contractors Application for Payment shall not be approved for payment unless schedule is attached and Record Documents are current. The schedule shall be updated to show actual progress and the effect of delays and other events. The actual start and finish dates shall be included in the detailed report, as well as the actual dates of the Milestone events.

B. The content of the updated Construction Schedule shall be equal to that noted in Section 1.02 Construction Schedule.

C. The updated Construction Schedule submitted by Contractor shall not show a completion date later than the Contract Completion Date, subject to any time extensions approved by Owner.

3.07 REVIEW AND EVALUATION OF SCHEDULE

A. Participate in joint review and evaluation of schedule with Architect at each submittal.

B. Evaluate project status to determine work behind schedule and work ahead of schedule.

C. After review, revise as necessary as result of review, and resubmit within 7 days.

3.08 UPDATING SCHEDULE

A. Maintain schedules to record actual start and finish dates of completed activities.

B. Indicate progress of each activity to date of revision, with projected completion date of each activity.

C. Update diagrams to graphically depict current status of Work.

D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.

E. Indicate changes required to maintain Date of Substantial Completion.

F. Submit reports required to support recommended changes.

G. Provide narrative report to define problem areas, anticipated delays, and impact on the schedule. Report corrective action taken or proposed and its effectincluding the effects of changes on schedules of separate contractors.

3.09 RECOVERY SCHEDULE

A. Should the Contractor's Construction Schedule indicate that the progress of the work is behind schedule to the extent that any of the mandatory specific or milestone dates or completion dates are in jeopardy the Contractor shall be required to, at no extra cost to the Owner, prepare and submit to the Owner's Representatives within 72 hours, a Recovery Plan, in a form and detail appropriate to the need and explain and display how he intends to reschedule those activities to regain compliance with the Construction Schedule.

3.10 SCHEDULE REVISIONS

A. Should the Contractor, after approval of the initial Construction Schedule, desire to change his plan in construction, he shall submit his required revisions to the Owner's Representatives along with a written statement of the revisions including a description of the logic for rescheduling the work, methods of maintaining adherence to intermediate Milestones and Specific Dates and the reasons for the revisions. The Contractor shall revise his schedule to include the effect of changes, acts of God, and other conditions or events, which have affected the Schedule. If the requested changes are acceptable to the Owner and Owner's Representatives, the changes will be incorporated into the Construction Schedule in the next reporting period.

B. When the Owner orders changes by change Order which have the potential to impact the Contract Milestones or Specific Dates stipulated in the Supplemental Conditions, a Schedule will be prepared by the Contractor and provided to the Owner's Representatives for concurrence or revision. After the proposed schedule revision has been mutually agreed upon, it will be incorporated into the Construction Schedule. Change Order logic will affect only those activities and performance data directly concerned. Adjustments in Scheduled intermediate Completion Dates or for the Contract as a whole will be considered only to the extent that there is insufficient remaining float to absorb these changes.

C. Any change to the approved Construction Schedule must be approved, in writing, by the Owner and Contractor.

D. Neither the updating or revision of Contractor's Construction Schedule nor the submission, updating, change or revision of any report or schedule submitted to Owner's Representatives by Contractor under this Section nor Owner's review or non-objection of any such report or schedule shall have the effect of amending or modifying, in any way, the Contract Time, any Contract Completion Date, or Contract Milestone Dates or of modifying or limiting in any way Contractor's obligations under this Contract.

3.11 REQUESTED TIME ADJUSTMENT SCHEDULE

A. The updated Construction Schedule submitted by Contractor shall not show a completion date later then the Contract Time, subject to any time extensions approved by Owner:
   1. Provided, however, that if Contractor believes he is entitled to an extension of the Contract Time under the Contract Documents, Contractor shall submit to Owner's Representatives, with each progress payment update, a separate schedule analysis (entitled "Requested Time Adjustment Schedule") indicating suggested adjustments in the Contract Time which should, in the opinion of Contractor, be made in accordance with the Contract Documents by time extension, due to changes, delays or conditions occurring during the past month or previously, or which are expected or contemplated by Contractor (whether such conditions are excusable under the Contract or are alleged to be due to Contractor or Owner fault); this separate schedule, if submitted, shall be time-scaled utilizing a computer generated and computer-drawn Schedule analysis schedule, unless otherwise approved by the Owner's Representative and shall be accompanied or preceded by a formal time extension request as required by the Contract and a detailed narrative justifying the time extension requested.

B. The time extension request shall include schedule forecasts that predict the actual Project Completion Date, and any separable portions thereof specified by Owner plus a forecast of the actual achievement of any milestones listed in the Owner-Contractor Agreement.

C. To the extent any time extension requests are ending at the time of any update in the Construction Schedule, the “Requested Time Adjustment Schedule” shall also be updated each month, to reflect any adjustments made by Contractor in the logic, sequence or duration of any activities in the Construction Schedule, or any time extensions previously granted by Owner, and to reflect actual or expected progress, in order that the “Requested Time Adjustment Schedule” shall clearly and accurately reflect Contractor’s Actual intention and proposed time adjustments as of the latest update.

D. Neither the Owner, the Project Manager or the Architect shall have any obligation to consider any time extension request unless the requirements of the Contract Documents, and specifically, but not limited to these requirements, are complied with; and Owner shall not be responsible or liable to Contractor for any constructive acceleration due to failure of Owner to grant time extensions under the Contract Documents should Contractor fail to substantially comply with the submission requirements and the justification requirements of this Contract for time extension requested. Contractor’s failure to perform in accordance with the Construction Schedule shall not be excused, nor be chargeable to Owner, because Contractor has submitted time extension requests or the "Requested Time Adjustment Schedule”.

3.12 DISTRIBUTION OF SCHEDULE

A. Distribute copies of updated schedules to Contractor's project site file, to subcontractors, suppliers, Architect, Owner, and other concerned parties.

B. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

END OF SECTION

SECTION 01 4000
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Submittals.

B. Quality assurance.

C. References and standards.

D. Testing and inspection agencies and services.

E. Contractor's construction-related professional design services.

F. Contractor's design-related professional design services.

G. Control of installation.

H. Mock-ups.

I. Tolerances.

J. Manufacturers' field services.

K. Defect Assessment.

1.02 RELATED REQUIREMENTS

A. Document 00 3132 - Geotechnical Data

B. Section 01 4516 - Contractor Quality Control. Testing and Inspection services.

C. Section 01 4533 - Code-Required Quality Control.

1.03 CONTRACTOR'S CONSTRUCTION-RELATED PROFESSIONAL DESIGN SERVICES

A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.

B. Provide such engineering design services as may be necessary to plan and safely conduct certain construction operations.

1.04 CONTRACTOR'S DESIGN-RELATED PROFESSIONAL DESIGN SERVICES

A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract. Contractor, and its Delegated Design Professional, shall be responsible for coordinating with the Design-Related Professional Design Services with the Architect.

B. Base design on performance and/or design criteria indicated in individual specification sections. Design shall be coordinated with and or compatible with all other applicable elements, materials, products, and or components in the Contract Documents.
   1. Submit a Request for Information to Architect if the criteria indicated are not sufficient to perform required design services.
   2. Submit a Request for Information for any issue necessary to fully and properly coordinate and complete the design in accordance with the Contract Documents.

C. Contractor's Delegated Design Professional shall be responsible for code compliance of all aspects of the Delegated Design whether or not all codes and or their specific code requirements are specifically identified and or called out in the Contract Documents.

D. Contractor shall coordinate with, and obtain written approval from, the Architect for any Delegated Design results that modify the original intent of the Contract Documents regarding occupancy, aesthetics, function, performance, or any design feature.

E. Contractor shall promptly provide written notification to the Architect when Contractor becomes aware of any errors and or omissions regarding the Contractor's professional design services.

F. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by the Contractor or the Delegated Design Professional. 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.

G. Shop drawing sheets that include engineering information designed by the Contractor's Delegated Design Engineer shall be signed and sealed in accordance with the Texas Engineering Practice Act. Sheets that do not provide information designed by the Contractor's Engineer do not require being signed and sealed. Calculation packages require a signed and sealed cover sheet only. Any submittals requiring to be signed and sealed that are received without the signature and seal will be rejected without review.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures, including but not limited to submittal review responsibilities.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Contractor by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in Texas.
   1. The General Contractor or Construction Manager shall comply with the Texas Professional Services Procurement Act when selecting an Engineer for Delegated Design Services.

1.07 REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

C. Obtain, review and comply with copies of standards where required by product specification sections.

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

F. Neither the contractual relationships, duties, or responsibilities of the Owner, Architect, Contractor or any of their respective subconsultants or subcontractors shall be altered from Contract Documents by mention or inference otherwise in any reference document.

1.08 TESTING AND INSPECTION AGENCIES AND SERVICES

A. A Special Inspection and Testing Agency (SITA) will perform field quality control tests and inspections, as specified in specification Section 01 4516 - Contractor's Quality Control and Section 01 4533 - Code-Required Quality Control.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 MOCK-UPS

A. Before installing portions of the Work where mock-ups are required, construct mock-ups for each form of construction and finish required, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.

B. Integrated Exterior Mock-ups: Construct integrated exterior mock-up. Coordinate installation of exterior envelope materials and products as required in individual Specification Sections. See Section 04 2000-Unit Masonry for additional mock-up requirements for field sample panels and integrated envelope and wall assembly.

C. Integrated Room Mock-ups: Construct integrated room mock-ups for one room type of each classroom, office, and restroom. Mock-ups shall include the scope per contract documents along with Owner furnished equipment.

D. Obtain Owner and Architect's approval of mock-ups before starting work, fabrication, or construction.
   1. Make corrections as necessary until Owner and Architect's approval is issued.

3.03 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate beyond the maximum overall allowable tolerance level.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

3.04 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.

B. Submit qualifications of observer to Architect 30 days in advance of required observations.
   1. Observer subject to approval of Architect.
   2. Observer subject to approval of Owner.

C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.05 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not complying with specified requirements.

B. If, in the opinion of Architect and Owner, it is not practical to remove and replace the Work, Owner will direct an appropriate remedy or adjust payment.

END OF SECTION

SECTION 01 4100
REGULATORY REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY OF REFERENCE STANDARDS

A. Related Documents: General and Supplementary Conditions of the Contract, Division 01 General Requirements, and Drawings are applicable to this Section.

B. Section Includes, but is not limited to:
   1. Permits and fees.
   2. Code and regulatory compliance for the associated Work.

C. 2012 TAS - Texas Accessibility Standards; 2012.

D. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

1.02 RELATED REQUIREMENTS

A. Section 01 4000 - Quality Requirements.

1.03 PERMITS AND FEES

A. The Owner will pay for all City and/or State Building Permits, Impact Fees, and other Building Fees related to the project. The Contractor and Subcontractors will be responsible for obtaining all required trade permits or license fees.

B. Once General Contractor is in possession of the final construction permits (building permits), Contractor shall be responsible for submitting to the AHJ, approved request for pricing (RFP), change orders, or other documents that contain significant changes to the contract until construction is complete. Contractor shall pay for permits or fees associated with any required changes.

1.04 BUILDING CODES

A. Building Code Compliance: Reference drawings for year editions used in document design.
   1. Building Code – International Building Code
   2. Plumbing Code – International Plumbing Code
   3. Mechanical Code – International Mechanical Code
   4. Electrical Code – National Electrical Code
   5. Life Safety Code – NFPA 101

B. Energy Code Compliance
   1. Energy Code – International Energy Code.
   2. Contractor shall provide, at the jobsite office, one copy of the completed energy code review.
   3. Contractor shall notify energy code plan review company for all required energy inspections.
      a. Milestones for inspections shall be as follows:
         1) Envelope: Building cladding is substantially complete, windows are delivered and installed, roof insulation has been installed and if possible is visible, interior finish of exterior walls has not been installed so any exterior wall insulation is visible
         2) ME rough-in: Mechanical ductwork is substantially installed, equipment is set, lighting fixtures are installed, ceiling is open (equivalent to an above-ceiling inspection)
         3) Final: Final verification of all mechanical, lighting, controls, envelope as installed and commissioned. Envelope penetrations (e.g. doors, windows) are closed, roof is complete.
      b. Contact Information:

1) Building Solutions
9401 Lyndon B. Johnson Freeway, Suite 410
Dallas, Texas, 75243
Phone: 214.221.9145

C. Accessibility Compliance
1. Accessibility requirements are from the 2010 ADA Standards for Accessible Design, and the 2012 TAS Texas Accessibility Standards of the Architectural Barriers Act.
2. The information contained in this section is provided to identify the modifications provided for users who are not served by adult standards. It shall be the Contractors responsibility to be familiar with the standards and to apply the standards to all aspects of the project. Any apparent conflict between current standards and the drawings shall be brought to the architect's attention for clarification. The information in the drawings does not release the contractor from full compliance with the latest TAS requirements.
3. Contractor shall provide, at the jobsite office, one copy of the 2012 Texas Accessibility Standard (TAS) regulations as prepared by the Texas Department of Licensing and Regulation, concerning handicap accessibility. The Contractor shall conform to the regulations as set forth in the TAS. Copies can be obtained at Texas Department of Licensing and Regulation, P.O. Box 12157, Austin, TX; 512-539-5669 / Fax 512-539-5690; www.license.state.tx.us. Copies may be downloaded from http://www.license.state.tx.us/ab/abtas.htm.
4. Federal Register:
   a. Vol. 56, No. 144, July 26, 1991, Rules and Regulations; Appendix A to part 36 – Standards for Accessible Design.
   b. 5 U.S.C. 552(a) and 1 C.F.R. part 51, Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Building Elements Designed for Children's Use.
5. Texas Accessibility Standards
   a. The Elimination of Architectural Barriers Texas Government Code, Chapter 469, effective March 15, 2012.

1.05 ACCESSIBILITY REQUIREMENTS

A. General
1. All general TAS standards apply and staff-use areas and spaces for the use of students above the age of 12 shall be designed for adult users. In facilities for younger students, adult-use spaces will commonly be identified by their name (MEN, WOMEN, STAFF TLT, etc). Juvenile-use spaces will be likewise identified (BOYS, GIRLS, STU TLT, etc.).
2. Besides the transition to adult dimensions for students above the age of 12, some requirements vary additionally, depending on age. Refer to the tables enclosed for the varying heights and spacing required.
3. Age/Grade ranges are interpreted as follows:
   a. Ages 3 years and 4 years / Pre-Kindergarten
   b. Ages 5 years thru 8 years / Kindergarten thru 3rd Grade
   c. Ages 9 years thru 12 years / 4th Grade thru 7th Grade
   d. Over 12 years / 8th Grade thru Adult

B. Dimensional Tolerances
1. Contractor is reminded that while the TAS guidelines allow for "construction and manufacturing tolerances" there is no "definition" of what that tolerance is, therefore, where TAS gives a single absolute dimension, every effort should be made to equal that dimension. Where TAS provides a dimensional range, or a minimum or a maximum, there is NO construction tolerance. Any dimension less than the minimum or more than the maximum will be rejected upon inspection and subject to correction.

1.06 QUALITY ASSURANCE

A. Contractor's Designer Qualifications: Refer to Section - 01 4000 - Quality Requirements.

PART 2 PRODUCTS

2.01 GENERAL

A. Contractor shall note that no regulatory agency designates products with a formal “ADA Approved” designation. Contractor shall be responsible for ensuring all products are reviewed for accessibility compliance.

PART 3 EXECUTION

3.01 REPAIR

A. Non-Compliant Work
   1. The Contractor shall be responsible for removing and correcting all work that is found to be in non-compliance.
   2. The Contractor shall perform all work at no expense to the Owner.
   3. The Contractor shall be responsible to perform all repairs regardless of the date at which the non-compliant items are found.

B. The work shall be performed such that there will be no disruption to the Owner schedule.

END OF SECTION

SECTION 01 4339
MOCK-UP WALL CONSTRUCTION

PART 1 – GENERAL

1.01 DESCRIPTION

A. An Envelope Pre-construction meeting shall be held with all of the subcontractors responsible for erecting the envelope related materials.
   1. Attendees shall include (but are not limited to): General Contractor, framing and sheathing subcontractor, masonry subcontractor, weather barrier subcontractor, storefront and glazing subcontractor, roofing and sheet metal subcontractors, metal wall panel subcontractors, mechanical and electrical subcontractors, and any other trade that will install products in the exterior building envelope, or penetrate through the exterior envelope.

B. Work includes: Constructing in-place mock-up, including all reviewed submittals required by the Contract Documents, to establish compliance with the design intent as well as the specified requirements to provide a complete and watertight facility.

C. Providing a photo manifest of as-built conditions as the mock-up is being constructed. Photos shall be kept at the job site during construction for reference. All Photos shall be documented on a plan of the mock up, where they were taken.

D. Mock-up fabrication must be completed and reviewed and approved by the Owner and Architect prior to starting installation of building envelope construction.

1.02 RELATED REQUIREMENTS

A. Individual sections of these specifications for each material indicated for use in the mock-up wall construction.

1.03 SUBMITTALS

A. Section 01 3000 – Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate dimensions, layout, joints, construction details, methods of anchorage, etc. as required for items to be installed in the mock-up wall construction.

C. All submittals for materials required in the mock-up walls shall be approved prior to beginning work on the mock-up wall construction.

D. Provide a compatibility matrix of all envelope materials to be used on the project.

E. Provide required test reports for envelope materials.

1.04 PURPOSE

A. The mock-up wall panels are to be constructed as indicated on the drawings, including toothed masonry construction to allow exposed flashings, etc. Construction of the mock-up walls are intended to:
   1. Provide an acceptable quality standard for the completed work.
   2. Identify color and finish selections of the various materials used, as well as the acceptable range of color and variations within those materials.
   3. Establish the required coordination between trades and the sequence of necessary installations to provide a complete and watertight building envelope.

1.05 QUALITY ASSURANCE

A. Coordination of product submittals and construction installation:
   1. Prior to each submittal, carefully review and coordinate all aspects of each item being submitted.
   2. Verify that each item being submitted is in conformance in all respects with the specified requirements.

3. By affixing the Contractor's signature to each submittal for the mock-up, the contractor certifies that this coordination has been performed.
4. Contractor shall construct the site built mock-up with the same manner of specified construction as the new construction.
5. Contractor shall construct the site built mock-up with the same workmanship and quality as being implemented on the new construction.
6. All material to be installed shall be reviewed by architect and consultants for conformance.

PART 2 – PRODUCTS

2.01 MOCK-UP REQUIREMENTS

A. Build in-place mock-ups to verify selections made under sample submittals and to demonstrate aesthetic effects and qualities of materials and execution. Mock-up wall construction shall be coordinated by the General Contractor and constructed by the subcontractor responsible for the actual construction work. All conditions and materials to be used on the job shall be included in the mock-up. Build mock-ups to comply with the listed requirements, using materials indicated for the completed Work. Construction of mock-up shall be complete 60 days minimum, prior to installation of cladding materilas at the primary structure.

B. Contractor shall start the construction of the mock-up based on, but not limited to, the following list:
   1. Foundation if subgrade is present
   2. Waterproofing membrane
   3. Damproofing material
   4. Flexible Through-Wall Flashing Membrane
   5. Metal Through-Wall Flashing
   6. Preformed Flashing Pieces
   7. Face Brick with Mortar and Weeps
   8. CMU with mortar and weeps
   9. Wall Ties
   10. Weather Barrier
   11. Portland Cement Plaster
   12. Metal Panels, Wall and Soffit
   13. Metal Roof Panels
   14. Low Slope Roof System
   15. Weeps
   16. Window Unit with flexible flashing membrane
   17. Louver Unit

C. Samples and Manufacturer's Submittals: Submit prior to delivery or installation.
   1. Samples of all building system components including all specified accessories.
   2. Submit samples of proposed warranties complete with any addenda necessary to meet the warranty requirements as specified.
   3. Submit latest edition of manufacturer's specifications and installation procedures. Submit only those items applicable to this project.
   4. A written statement from the materials manufacturer approving the installer, specifications and drawings as described and/or shown for this project and stating the intent to guarantee the completed project.
   5. Follow submitted shop drawings, product data of all sheet metal.

D. Scale and Measurements: Make Shop Drawings accurately to a scale sufficiently large enough to show all pertinent aspects of the item and its method of connection to the work.

E. Shop Drawings and Product Data: Provide manufacturer's approved details of all conditions, projection conditions, and any additional special job conditions which require details other than indicated in the drawings.

1. Manufacturer's Details: All termination details and other details normally required by the manufacturer's Technical Specifications, including both standard details and special details, shall be furnished by the Contractor and shall be approved in writing by the manufacturer, the company project manager, and the Owner's representative prior to final installation.

F. Provide manufacturer's approved details, of all perimeter conditions, project conditions, and any additional special job conditions which require details other than indicated in the drawings.

2.02 MANUFACTURER'S LITERATURE

A. Work provided on the mock-up shall follow all of the submitted literature from manufacturers.

B. Manufacturer’s literature shall be the minimum for basis of design and shall be in conjunction with construction documents. All manufacturers' warranties shall remain in effect as specified.

2.03 SAMPLES

A. Provide sample or samples identical to the precise article proposed to be provided.

2.04 COLORS AND PATTERNS

A. Unless the precise color and pattern are specifically called out in the Contract Documents, and whenever a choice of color or pattern is available in the specified products, submit accurate color and pattern charts to the Architect/Project Manager for selection in advance of the Envelope Pre-Construction meeting.

B. Contractor shall coordinate with Architect for exact layout or design of patterns and textures and how they are to be installed on the mock-up.

PART 3 – EXECUTION

3.01 ENVELOPE PRE-CONSTRUCTION MEETING

A. Begin construction of mock-up wall prior to envelope pre-construction meeting, at location determined by Architect. Progress should be sufficient to review installation of weather barrier and flashings as part of envelope pre-construction meeting.

B. Convene a minimum of one week prior to initiation of the mock-up wall construction. Size and location of in-place mock-up to be determined at this meeting.

C. Verify that all required submittals have been approved and that color/finish selections have been made.

D. Establish coordination between trades and establish sequencing of material installations to ensure a complete and watertight assembly.

E. Distribute meeting minutes and agreed upon sequencing to all subcontractors.

F. Construct mock-up walls in accordance with the established procedures and installation sequencing.

3.02 INSTALLATION OF MATERIALS

A. Contractor shall install all materials on mock-up in same manner required for the main structure. Refer to specification sections for basis of design of all material being installed on this mock-up.

B. During installation, Contractor shall maintain a photo manifest of mock-up construction for Architect and Owner to review.

C. Quality of installation is of utmost importance and shall be monitored for completeness and conformance with the design intent and manufacturer's installation recommendations.

D. Once mock-up is complete, it shall be reviewed by the Architect and Owner’s Representative for conformance to construction documents.

E. Contractor shall install material in same sequencing as required by industry standards.

3.03 INSTALLATION OF WINDOWS AND ASSOCIATED FLASHING

A. Installer shall coordinate the installation of the window with associated trades to maintain proper compatibility of material.

B. Installation shall be in accordance with referenced specifications.

C. Install all perimeters flashing as detailed to create a sealed air and watertight condition.

D. Once window flashing and weather barrier have been installed, but prior to the installation of cladding, Contractor shall notify Architect, Owner and Consultants for review for conformance and shall coordinate a water test of surrounding flashings per Division 08. Contractor shall notify Architect, Owner and Consultants to observe the testing. All tests shall be in accordance with referenced specifications.

3.04 INSTALLATION OF FLASHING AT THROUGH-WALL LOCATION

A. Installer shall coordinate the installation of the wall flashing with associated trades to maintain proper compatibility of material.

B. Installation shall be in accordance with referencing specifications.

C. Once flashing has been installed, Contractor shall notify Architect, Owner and Consultants for review for conformance.

3.05 QUALITY ASSURANCE

A. Air Barriers
   1. Conduct wet film thickness readings throughout application of the membrane to confirm compliance with manufacturers requirements.
   2. At transitions between materials provided by different manufacturers provide adhesion testing of the air/weather barrier by a third party agency per ASTM D4541, *Test Method for Pull-off Strength for Coatings Using Portable Adhesion Testers* at a minimum of (1) location for each transition condition;
      a. The manufacturer shall provide the minimum pull off strength in pounds per square inch (psi). In the event that the manufacturer cannot provide this data, the minimum pull off strength considered “passing’ shall be 100 pounds per square inch.

B. Sealant Joints
   1. Provide sealant adhesion testing, with and without primer, at various substrate conditions, as required by the specifications and/or manufacturer’s instructions included as part of the product submittals.
   2. Submit report to Architect.

C. Glazing Systems
   1. Provide specified testing of the glazing system by a third party testing agency. Provide minimum of one (1) test per each specification section. In the event multiple tests are specified, the most stringent test shall be required at the mock-up condition.

3.06 CONSTRUCTION SCHEDULE

A. Once installation sequences have been determined and mock-up wall construction has been approved, modify the Construction Schedule to reflect the established sequencing of material installations and testing requirements. Distribute revised schedule.

END OF SECTION

SECTION 01 4516
CONTRACTOR'S QUALITY CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Control of installation.

B. Testing and inspection services by one or more quality assurance laboratories to be employed by the Contractor (if these services are not provided by subcontractors or material suppliers). The purpose of quality assurance services are so that the Contractor can verify work is done properly during construction, before the Contractor requests that the Owner's Independent Quality Control Agency performs code-required special inspections, tests and structural observations. The Contractor's QA Laboratory testing and inspection services shall include, but not be limited to:
   1. Testing, inspection, and certifications specified in sections of Project Manual other than Section 01 4533. This quality assurance testing shall be paid by the Contractor.
   2. Earthwork borrow pit material verification
   3. Concrete mix design verification
   4. Masonry unit compressive strength verification
   5. Structural Steel quality assurance recommended by AISC
   6. HVAC Testing and Balancing
   7. Indoor Air Quality Testing
   8. Certification of No Asbestos Containing Materials

C. References and standards.

D. Manufacturers' field services.

1.02 RELATED REQUIREMENTS

A. Document 00 3132 - Geotechnical Data

B. Section 01 3000 - Administrative Requirements: Submittal procedures.

C. Section 01 4000 - Quality Requirements

D. Section 01 4533 - Code Required Quality Control

E. Section 01 6000 - Product Requirements: Requirements for material and product quality.

1.03 REFERENCE STANDARDS

A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008 (Reapproved 2014).

B. ASTM C1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation; 2014.

C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry; 2013.

D. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2012a.

E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2014a.

F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2013.

G. IAS AC89 - Accreditation Criteria for Testing Laboratories; 2010.

1.04 QUALITY ASSURANCE (OF CONTRACTOR'S QUALITY ASSURANCE LABORATORY)

A. Contractor's QA Laboratory Qualifications and Procedures:

1. Meet "Recommended Requirements for Independent Laboratory Qualification," latest edition published by American Council of Independent Laboratories. Testing agencies shall meet the requirements of ASTM E 329, "Recommended Practice for Inspection and Testing Agencies for Concrete, Steel and Bituminous Materials as Used in Construction" and ASTM E 543, "Determining the Qualification of Nondestructive Testing Agencies."
2. The inspection and testing services of the testing agency shall be under the direction of a Registered Engineer licensed in the State of Texas, charged with engineering managerial responsibility, and having at least five years engineering experience in inspection and testing of construction materials.
3. Inspecting personnel monitoring concrete work shall be ACI certified inspectors.
4. Submit copy of report of inspection of facilities made by Materials Reference Laboratory of National Bureau of Standards during most recent tour of inspection. Include memorandum of remedies of deficiencies reported by this inspection.
5. Testing Equipment: Calibrated at reasonable intervals by devices of accuracy traceable to either National Bureau of Standards or accepted values of natural physical constants.
6. Tests and inspections shall be conducted in accordance with specified requirements and if not specified, in accordance with applicable standards of the American Society for Testing and Materials and other recognized authorities as approved.
7. 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." The inspector may be supported by assistant inspectors who may perform specific inspection functions under the supervision of the inspector. Assistant inspectors shall be currently certified AWS Certified Associate Welding Inspectors (CAWI). The work of assistant inspectors shall be regularly monitored by the inspector, generally on a daily basis.

1.05 REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

C. Obtain copies of standards where required by product specification sections.

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

A. See Section 01 4000 - Quality Requirements

3.02 GENERAL REQUIREMENTS FOR CONTRACTOR'S LABORATORY SERVICES

A. The Contractor shall perform various tests as required in the various specification sections for conference to the construction documents other than those in Section 01 4533. The Owner maintains the right to verify the test results with an independent testing lab.

B. Contractor's design testing and certification testing includes:
   1. Testing defined in this Specification Section.
   2. Testing when source of material is changed after initial tests have been performed.
   3. Other testing required by other Sections of the Specifications.

3.03 EARTHWORK

A. Earthwork: Identify suitable material at borrow material location, sampling soil material, and testing of soil material samples.

3.04 ACIP PILES

A. The Contractor shall provide all equipment, materials and labor required for any ACIP Pile Load Tests specified in Section 31 6316.

3.05 CONCRETE

A. Furnish 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, the laboratory shall be selected by the Contractor, approved by the Architect, and paid by the Contractor.

3.06 MASONRY

A. Furnish laboratory testing from the manufacturer or a Contractor-hired laboratory that verifies the compressive strengths of masonry units comply with specifications.

B. Absorption Tests:
   1. Perform a field of test for water absorption on three representative clay units and at least once for each 5,000 square feet of wall before laying.
   2. The field test shall consist of drawing a one inch diameter circle with a wax pencil (the diameter of a quarter). Place thirty (30) drops of water from a medicine dropper in rapid succession with the circle. If all of the water is absorbed into the brick in less than 60 seconds, the units shall be deemed "to dry" and shall be prewetted.

3.07 STRUCTURAL STEEL

A. Provide current welder certifications for each welder to be employed.

B. Performing certified welding procedure qualification and re-qualification testing specified in Section 05 1200, 05 2100, 05 3100, 05 4000, 05 4400, 05 5000 and 13 3419 and as recommended by the American Welding Society.

C. Testing of materials when mill certificates are unavailable.

3.08 HVAC TESTING AND BALANCING

A. The Contractor shall provide complete testing and balancing services for all HVAC and control systems to be carried out by an independent certified testing and balancing (TAB) agency under a separate and direct contract with the General Contractor. Scope of testing and balancing services, Contractor obligations, etc. shall be in accordance with Testing, Balancing and Commissioning specification section.

3.09 INDOOR AIR QUALITY TESTING

A. The Contractor shall provide complete air quality testing services for the project to be carried out by an independent certified agency under a separate and direct contract with the General Contractor. Scope of testing services, Contractor obligations, etc. shall be in accordance with Section 01 5719 – Indoor Air Quality Requirements.

3.10 CERTIFICATION OF NO ASBESTOS CONTAINING MATERIAL

A. The Contractor shall provide the Architect a written certification of the following;
   1. Hazardous material-free construction – certify that no asbestos containing material was used and/or incorporated into the project during construction.
   2. The statement shall be as follows:

a. The undersigned, pursuant to the General and Supplementary Conditions of the Contract for Construction, hereby certifies that to the best of his/her knowledge, information and belief, the materials incorporated into the project and as used during the construction process are free of any type of asbestos material, lead, polychlorinated biphenyl (PCB) or other materials identified by governmental agencies as being hazardous.

3.11 MANUFACTURERS' FIELD SERVICES

A. See Section 01 4000 - Quality Requirements

3.12 DEFECT ASSESSMENT:

A. See Section 01 4000 - Quality Requirements

END OF SECTION

SECTION 01 4533
CODE-REQUIRED QUALITY CONTROL

PART 1 GENERAL

1.01 IMPORTANT NOTE FOR ALL PLAN REVIEWERS (AHJ) TO READ BEFORE ISSUING A BUILDING PERMIT!

A. This Section (Specification Section 01 4533) is the "Statement of Special Inspections, Testing, Structural Observations and Commissioning" for this project and is hereby submitted to the building official for review and approval. This statement has been prepared collaboratively by the Architect and appropriate Design Professionals such that the registered design professional responsible for the design of each portion of the work considered the requirements of Chapter 17 of the International Building Code (IBC), considered the Commissioning requirements of the International Energy Conservation Code, considered the nature of the work, and then customized this statement specifically for this project based on their professional opinion of what they recommend for the code-required quality control plan. In some instances, the special inspections, testing and/or structural observation required by this statement are significantly less than the special inspections, testing and/or structural observations that would be required by the IBC without Exception #1 in IBC Section 1704.2 which states special inspections, tests, and/or structural observations are not required for construction as warranted by conditions in the jurisdiction as approved by the building official. This customized quality control plan also includes some variations from procedures required by IBC Chapter 17, such as submitting certain items to Registered Design Professionals in lieu of the AHJ; these variations are based on procedures that AHJ's have indicated are preferred and also the experience of the Registered Design Professionals which indicates that this quality control plan (including these procedural variations) will meet or exceed the local standard of care. It is our understanding that the AHJ has the authority to allow these procedural variations on code-required quality control because the AHJ has the authority to waive the entire quality control plan under Exception #1 in IBC Section 1704.2. According to IBC Section 105.3.1, "If the application or the construction documents do not conform to the requirements of pertinent laws, the building official shall reject such application in writing, stating the reasons therefor. If the building official is satisfied that the proposed work conforms to the requirements of this code and laws and ordinances applicable thereto, the building official shall issue a permit therefor as soon as practicable." Therefore, if a building permit is issued without written notification that this statement or a portion thereof is rejected, it will be understood that this Statement of Special Inspections, Testing, Structural Observations and Commissioning is acceptable in the opinion of the building official, who has the authority to render interpretations of the code according to IBC Section 104. For clarification, this Statement includes the information required by IBC Section 1704.5 to be submitted to the AHJ before commencement of structural observations.

B. Chapter 17 of the International Building Code requires that the AHJ approve Special Inspection and Testing Agency (SITA) staff qualifications and requires that discrepancies identified during construction be resolved in order to comply with the building code. Based on Huckabee's experience with numerous AHJ's, it is understood that, instead of the AHJ directly reviewing these qualifications and resolutions, it is acceptable to the AHJ for Registered Design Professionals to determine whether or not SITA staff qualifications are acceptable and determine what resolutions to discrepancies identified during construction comply with the building code, without soliciting the opinion of the AHJ. And, for clarification, some discrepancies that occur during construction often include scenarios in which the specified scope for a quality control agency was not performed due to the Owner not hiring an agency to do some portion of the scope, inaction by the Contractor, inaction by the hired quality control agency or a miscommunication between parties. Therefore, it shall be considered acceptable for the Registered Design Professionals for each respective design discipline to be considered the sole determinant of acceptable quality control agency qualifications and resolutions of discrepancies and not report these details to the AHJ, if a building permit is issued without written notification that this understanding is incorrect.

1.02 OWNER-PREPARED DOCUMENTS

A. Sections 01 1400 and 01 4533 require that the Owner participate in the preparation of certain documents (e.g. Owner Agreement with the SITA) before critical construction schedule milestones. Proposers shall assume for proposal purposes that the Owner will provide these documents or provide all necessary participation of these documents without causing a delay to the construction schedule. However, the Contractor shall notify the Owner in writing 45 days before such a document is necessary to avoid a delay, notifying the Owner in writing of the deadline necessary to avoid a delay.

1.03 REQUIREMENTS FOR QUALITY CONTROL

A. Requirements for Quality Control:
   1. Special inspections and testing services shall be provided by an agency to be selected and employed by the Owner, which is referred to herein as the Special Inspection and Testing Agency (SITA). The SITA may subcontract other firms to provide quality control services on behalf of the SITA as necessary; however, the SITA shall be responsible for providing directly or indirectly all of the SITA responsibilities defined in Section 01 4533.
   2. Commissioning services shall be performed by the Commissioning Agent (CxA) as specified in Division 01 and Divisions 22-26.
   3. As a general part of the Code-Required quality control plan, Design Professionals shall be notified at appropriate times and allowed to make site visits and visual observations for general conformance with the contract documents.
   4. It shall not be required to notify and obtain approval from the AHJ if alternative arrangements are made in hiring firm(s) to provide quality assurance services (e.g. Owner hiring multiple firms, Architect acting as the Owner's Agent and hiring the SITA, Owner hiring the Structural Observer, etc…)
   5. Each type of quality control service shall be considered separate from every other type of quality control service. The services by one quality control firm do not relieve the responsibility of the other quality control firm to provide their quality control services.

1.04 RELATED REQUIREMENTS

A. Document 00 3132 - Geotechnical Data

B. Section 01 1400 - Work Restrictions: Work restrictions related to quality assurance.

C. Section 01 3000 - Administrative Requirements: Submittal procedures.

D. Section 01 4000 - Quality Requirements.

1.05 DEFINITIONS

A. Authority Having Jurisdiction (AHJ): The agency or individual officially empowered to enforce the building, fire and life safety code requirements of the permitting jurisdiction in which the Project is located. Where the term "building official" is used, it shall refer to the AHJ

B. Code or Building Code: 2015 Edition of the International Building Code and documents referenced by that document.

C. Commissioning Agent (CxA): The agent specified to perform the Commissioning specified in Division 01 and Divisions 22-26.

D. Design Professionals: For the purposes of Section 01 4533, the term “Design Professionals” shall refer to every Design Professional responsible for the design, or making recommendations regarding the design, of any portion of the project, including but not limited to the Geotechnical Engineer, professionals that sealed drawings on the Contract Documents, as well as any professionals hired by the Contractor. (Examples on some projects may be the Geotechnical Engineer, Architect, Civil Engineer, Structural Engineer, Mechanical Engineer, Electrical Engineer, Contractor’s Cold Formed Metal Framing Engineer, Contractor’s Pre-Manufactured Canopy Engineer, Contractor’s Pre-Engineered Metal Building Engineer, Contractor’s Precast Concrete Engineer, etc…)

E. Special Inspection and Testing Agency (SITA): The agencies responsible for providing all required special inspections and testing defined by Section 01 4533.
   1. Where used in the contract documents, the following terms (if used) shall also refer to the Special Inspection and Testing Agency (SITA):
      a. "Special Inspection Agency"
      b. "Construction Materials Engineering Firm"
      c. "Construction Materials Testing Firm"
      d. "Owner's Testing Laboratory"
      e. "Independent Testing Laboratory"

F. Special Inspections and Tests: The Special Inspections and Tests for this project are the inspections and tests required by Section 01 4533. These special inspections and tests are independent of any inspections and tests conducted directly by Tomball ISD or Contractor.

G. Quality control observations: For the purposes of Section 01 4533, the term “quality control observations” shall refer to the observations by the following quality control personnel:
   1. CxA
   2. Design Professionals

H. Quality control observers: For the purposes of Section 01 4533, the term “quality control observers” shall refer to the personnel acting on behalf of the firms providing quality control observations.

I. Quality control personnel: For the purposes of Section 01 4533, the term “quality control personnel” shall refer to the personnel acting on behalf of the following as they perform quality control services associated with Section 01 4533:
   1. SITA
   2. CxA
   3. Design Professionals

J. Quality control services: For the purposes of Section 01 4533, the term “quality control services” shall refer to the services required by Section 01 4533 to be performed by the quality control personnel.

1.06 REFERENCE STANDARDS

A. ACI 318 - Building Code Requirements for Structural Concrete and Commentary ; 2011.

B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement ; 2015.

C. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field ; 2012.

D. ASTM C172/C172M - Standard Practice for Sampling Freshly Mixed Concrete ; 2010.

E. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel ; 2008.

F. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel ; 2011.

G. IAS AC89 - Accreditation Criteria for Testing Laboratories ; 2010.

H. IAS AC291 - Accreditation Criteria for Special Inspection Agencies ; 2012.

I. AASHTO R18 - Accreditation for Materials Testing Laboratories

1.07 APPROVAL OF SITA QUALIFICATIONS AND SCOPE

A. SITA Qualifications: Before performing any SITA services on this project, the SITA shall submit to the Architect a statement for approval by the Architect indicating that the SITA firm and SITA Staff that will be assigned to this project will meet the following qualifications. The SITA shall indicate the years of experience performing similar work if a listed certification is not held by any proposed personnel (e.g. “We will only assign staff to this project that meets the listed certifications in Section 01 4533 with the exception that our masonry inspection and testing personnel have at least 10 years of experience performing masonry inspection and testing on similar projects but do not have a TMS Certification”):

1. It shall be required that the Special Inspections and Testing Agency (SITA) be accredited by IAS according to IAS AC291 and IAS AC89, or be accredited by AASHTO (or AMRL) unless the SITA obtains written approval of their experience performing inspection and testing services on similar projects by the Architect.
2. It shall be required that the Construction Materials Engineer be a Professional Engineer with Construction Materials Engineering experience that is licensed in the State of Texas.
3. It shall be required that the Concrete Inspection Technicians be at least certified ACI (American Concrete Institute) Concrete Field Testing Technicians-Level I, unless the SITA obtains written approval of the technician's experience performing concrete inspection services on similar projects by the Structural Engineer.
4. It shall be required that the Concrete Testing Technicians be at least certified ACI (American Concrete Institute) Concrete Laboratory Testing Technicians-Level I, unless the SITA obtains written approval of the technician's experience performing concrete testing services on similar projects by the Structural Engineer.
5. It shall be required that the Masonry Inspection Technicians be at least certified International Code Council (ICC) Structural Masonry Special Inspector unless the SITA obtains written approval of the technician's experience performing masonry inspection services on similar projects by the Structural Engineer.
6. It shall be required that the Masonry Testing Technicians be at least certified International Code Council (ICC) Structural Masonry Special Inspector unless the SITA obtains written approval of the technician's experience performing masonry testing services on similar projects by the Structural Engineer.
7. It shall be required that the Steel Inspection and Testing Technicians (for both Structural Steel Framing as well as Cold Formed Metal Framing) be certified Associate Welding Inspectors as defined by AWS (American Welding Society) or have a higher certification by AWS unless the SITA obtains written approval of their experience performing inspection and testing services on similar projects by the Structural Engineer.
    a. Steel Inspection Technicians shall have passed within the last 2 years an eye examination with or without corrective lenses to verify the Technician has near vision acuity of Snellen English or equivalent at no less than 12 inches, and far vision acuity of 20/40 or better.
    b. Steel Inspection Technicians inspecting bolts shall have a minimum 2 years of experience inspecting bolts as part of regular inspections of structural steel systems.

c. Steel Testing Technicians performing non-destructive testing of welds other than visual shall be certified NDT Level II Technicians in accordance with the American Society for Nondestructive Testing Recommended Practice No. SNT-TC-1A.

8. It shall be required that the Technician providing special inspection services regarding firestopping at penetrations and joints be an IFC-Certified Inspector with a complete certificate indicating that the technician has passed the online exam and has complete the hands-on product training from at least four (4) firestop product manufacturers, or have written approval by the Architect of experience performing similar inspection services. It shall be permitted for “similar inspection” to be inspection of sprayed fire-resistant material if this experience is supplemented by a certificate or card indicating the technician has completed manufacturer’s training on the firestopping material submitted and approved for use on this project.
9. It shall be required that the individual(s) performing any inspection or testing services associated with sprayed fire resistant material (SFRM), mastic and intumescent fire-resistant coatings shall be Certified Fire Inspector I (CFI) by the National Fire Protection Association (NFPA) unless the SITA obtains written approval that the technician's experience performing similar inspections and testing services by the Architect.

B. SITA Scope: Before performing any SITA services on this project, the SITA shall submit to the Architect a statement (e.g. a copy of a fully executed agreement between the Owner and the SITA, or an email from the Construction Materials Engineer to the Architect) for approval by the Architect, indicating that the SITA will perform all work specified in Section 01 4533 to be performed by the SITA. An example of an acceptable statement is, “Our firm will provide all work specified in Section 01 4533 to be performed by the SITA for the [insert project name] located at [insert project address], Huckabee project number [insert project number].”

C. It shall be permitted for the SITA to provide one statement regarding both qualifications and scope.

1.08 APPROVAL OF CXA QUALIFICATIONS AND SCOPE

A. CxA Qualifications: Before performing any CxA services on this project, the CxA shall submit to the Mechanical and Electrical Engineers a statement for approval by the Mechanical and Electrical Engineers indicating that the CxA firm and CxA Staff that will be assigned to this project will meet the qualifications required by Division 01 and Divisions 22-26.

B. CxA Scope: Before performing any CxA services on this project, the CxA shall submit to the Mechanical and Electrical Engineers a statement (e.g. a copy of a fully executed agreement, or an email from the CxA) for approval by the Mechanical and Electrical Engineers, indicating that the CxA will perform all work specified in Division 01, Section 01 4533 and Divisions 22-26 to be performed by the CxA. An example of an acceptable statement is, “Our firm will provide all work specified in Division 01, Section 01 4533 and Divisions 22-26 to be performed by the CxA for the [insert project name] located at [insert project address], Huckabee project number [insert project number].”

C. It shall be permitted for the CxA to provide one statement regarding both qualifications and scope.

1.09 CONTRACTOR’S GENERAL RESPONSIBILITIES

A. It shall be the Contractor’s sole responsibility to comply with all requirements of the Contract Documents, without relying on any of the quality control services required by Section 01 4533. The purpose of quality control services is to simply provide some verification that the Contractor is complying with the Contract Documents.

B. As required by the International Building Code, the Contractor shall submit to Tomball ISD, the Building Official (AHJ), and the Architect a written "Acknowledgement of Contractor's Responsibilities Related to Code-Required Quality Control".

1. This statement shall identify this project as " Project Title", including Architect's project number.

2. The statement shall either include the following language or similar language: "As the Construction Firm responsible for the construction of this project, we acknowledge that we are aware of all the requirements of Specification Sections 01 1400 and 01 4533. In addition, we acknowledge that all firms currently under contract as Subcontractors to our firm on this project are also aware of the requirements of Specification Sections 01 1400 and 01 4533. We further acknowledge that we will make any firms we contract with in the future for this project also aware of these requirements prior to commencement of their scope of work."

C. If any steel fabrication occurs off-site (at a fabrication shop) that is not an AISC certified fabrication shop, the Steel Fabricator shall pay for the SITA to perform the special inspections or testing required by Section 01 4533 for all such off-site steel fabrication.

D. The Contractor shall notify quality control personnel at least five (5) business days before they need to visit the site to perform their services. In addition, the Contractor shall cooperate with quality control personnel, provide incidental labor, equipment and facilities to give them access to the work (including ladders and lifts), and provide space onsite for their operations and storage.
   1. If the Contractor does not request quality control services where required, the work that was not inspected and/or tested shall be considered deficient and the Contractor shall issue an RFI to the Architect immediately when the Contractor becomes aware of this deficiency.

E. The Contractor shall make accessible and visible all work requiring quality control services until all deficiencies are corrected or otherwise fully addressed.

F. Addressing Deficiencies in SITA Reports: The Contractor shall fully address all deficiencies noted by the SITA and notify the SITA when and how each deficiency was addressed. It shall be permitted to either correct the work in the presence of the SITA, provide evidence to the SITA that there was in fact no deficiency if that is the case, provide evidence to the SITA that the appropriate Design Professional(s) have determined that the deficiency from the contract documents is acceptable, or provide evidence to the quality control entity (e.g. SITA, CxA, or the respective design professional) that a remediation plan was approved by the appropriate Design Professional(s) and then constructed.

G. Addressing Quality Control Observations:
   1. The Contractor shall be responsible for addressing any observations verbally noted by Design Professionals during site visits as if these observations were noted in writing. If the Contractor would like a written record of those observations, the Contractor shall submit a record of their understanding of the conversation to the Architect and Design Professional.
   2. The Contractor shall be responsible for determining if any observations identify or provide evidence of any deficiencies (discrepancies from the contract documents).
   3. All deficiencies associated with observations by Design Professionals shall be addressed by the Contractor.
   4. Except for items noted by a Design Professional that are identified in an observation report as “registered”, the Contractor is not required to notify the Design Professional when deficiencies that are associated with observations by Design Professionals have been addressed in good faith by the Contractor. It shall be acceptable for the Contractor to address such items by correcting the discrepancy from the contract documents or determining that a deficiency does not in fact exist. Alternatively, it shall also be acceptable for the Contractor to issue an RFI proposing acceptance of the deficiency or a remediation, and then remediating if approved.

a. If the Design Professional requests at any time written correspondence that the Contractor has addressed deficiencies associated with any or all observations, the Contractor shall determine whether or not such deficiencies were addressed, resolve any deficiencies that were in fact not yet addressed, and then provide written correspondence indicating that all deficiencies associated with observations by the Design Professional have been corrected when all deficiencies have been corrected.

5. The Contractor shall correct or otherwise fully address all items noted by Design Professionals that are identified in an observation report as “registered”. After registered items have been corrected or otherwise fully addressed but before the Contractor is permitted to install construction which obstructs view of the correction or noted condition, the Contractor shall submit to the Design Professional acceptable evidence of how the item was addressed. The Design Professional shall be the sole determinant of what is considered acceptable evidence and the Design Professional may require a follow-up site visit to make observations. Examples of acceptable evidence might be a photograph emailed by the Contractor, a report from the SITA, or a conversation with the Architect’s representative.

H. If deficiencies are brought to the Contractor’s attention by quality control personnel, the Contractor shall issue a Request For Information (RFI) to the Architect if direction is needed to resolve the item. This RFI shall include the Contractor's suggested course of action to address the deficiency. Unless the Contractor completely removes nonconforming work and replaces it with conforming work, it is the Contractor's responsibility to hire design professionals as required to design any remediation preferred by the Contractor, to be submitted to the Architect for consideration. This RFI may also include a request for acceptance of the deficiency based on an evaluation by the appropriate project design professional(s) such as the Structural Engineer of Record. The entire cost and schedule impact of any deficiencies identified by inspections and/or tests shall completely be the responsibility of the Contractor, at no additional cost to Tomball ISD. Tomball ISD reserves the right to assess liquidated damages associated with any and all delays due to addressing deficiencies.

1. If the Contractor would like Design Professional(s) such as the Structural Engineer of Record to design a remediation in lieu of the Contractor hiring design professionals, it shall be permitted for the Contractor to make this request in the RFI. However, project design professional(s) shall have no obligation to design any remediation and shall be permitted to charge for design services. The Contractor shall provide a deadline for the requested design in the RFI, or it may be assumed that the schedule of this resolution is not time-sensitive. If the project design professional(s) do not produce an approved remediation design by this deadline (even if there is no response to the RFI), the Contractor shall either remove nonconforming work and replace it with conforming work or hire design professionals to design a preferred remediation to be submitted for consideration by the Architect. The Contractor shall be responsible for any delays due to attempts by project design professional(s) to design remediation’s by the requested deadline.

I. The Contractor shall pay for all re-inspections and re-tests performed after quality control personnel have identified deficiencies, regardless of who is paying for the basic quality control services. The Contractor shall also pay for any tests, inspections and/or observations not required by Section 01 4533 but requested by the Contractor.

J. The Contractor shall be responsible for paying (either directly or by reimbursing the Owner or Architect) for all additional services by quality control personnel associated with addressing deficiencies.

1. Design Professionals shall be permitted to bill the Contractor at their standard hourly rates and it shall be the Contractor’s responsibility to realize that the Contractor shall be responsible for paying for any time a Design Professional spends performing additional services such as responding to RFI’s regarding deficiencies, attending meetings regarding deficiencies, making site visits to address deficiencies.

2. In general, many Design Professionals do not charge for these services; however, on this project, Design Professionals shall be permitted to bill or not bill the Contractor at their discretion and the Contractor shall be required to pay all such bills.
3. Design Professionals are not obligated to inform the Contractor in advance what that Design Professional's standard hourly rates are or how much time will be spent or even whether or not that Design Professional intends to submit a bill; the Contractor shall be obligated to ask Design Professionals how much time a task may take and otherwise keep track of these items if the Contractor desires to consider hiring a different Design Professional to assist them in addressing deficiencies.
4. These additional services are often short duration items scattered over a long period of time; the Design Professionals shall be permitted to send the Contractor a bill for all services associated with addressing deficiencies at the end of the project before a Certificate of Final Completion is issued. The Owner shall be permitted to pay for these services out of the Contractor's Retainage.

1.10 SITA'S GENERAL DUTIES AND RESPONSIBILITIES

A. Role: The Special Inspection and Testing Agency (SITA) shall provide Construction Materials Engineering services, with a Construction Materials Engineer that directly supervises all SITA responsibilities and evaluates whether or not reports from inspections and/or tests conform with construction requirements in the drawings and specifications related to the specific inspections and/or tests required by Section 01 4533.
   1. It shall be the Contractor's sole responsibility to comply with all requirements of the Contract Documents, without relying on any of these quality control services. The purpose of the quality control services provided by the SITA is to simply provide some verification that the Contractor is complying with the Contract Documents.
   2. For clarification, acting under the supervision of the SITA's Construction Materials Engineer, the SITA's personnel shall be permitted to use judgment and experience when measuring dimensions and locations of elements where required by this specification section, to verify conformance with the design intent rather than measuring all instances. For example, where Section 01 4533 requires that the SITA verify locations and or dimensions of all elements for a certain type of construction, it shall be acceptable for the SITA personnel to field measure only a fraction of those dimensions (e.g. "random sampling") when non-measured conditions visually appear to conform, measuring at a frequency determined by the SITA to be appropriate using judgment and experience (rather than field measuring every dimension). Furthermore, the SITA may increase or decrease the frequency of these field measurements depending on how often deficiencies are encountered.
   3. The SITA shall not be permitted to release, revoke, alter, or enlarge on any requirements of Contract Documents; approve or accept any portion of the work; or, assume any duties of the Contractor. The SITA shall not have the authority to stop the work.

B. Contractor's Work Restrictions: The Work Restrictions in Section 01 1400 related to Quality Control require that the Contractor obtain certain documents from the SITA and host certain meeting that the SITA attends, before certain construction milestones for the project to proceed. The SITA shall cooperate with the Contractor, providing those items and attending those meetings within a reasonable time frame.

C. Pre-Construction Meetings: The SITA shall participate (in person or on the phone) at the Foundation Pre-Construction Meeting, Quality Control Pre-Construction Meeting, and Framing Pre-Construction Meeting.

D. SITA Reports: After each special inspection or test, the SITA shall issue a report electronically to the Architect, Contractor, and the Design Professional requiring the report (e.g. concrete cylinder test reports for the foundation shall be submitted to the Structural Engineer), and anyone else the Architect indicates should be included in the distribution (e.g. AHJ, Owner, Construction Observer, etc…). These reports shall include the project title and number and information deemed appropriate by the Construction Materials Engineer.

E. Addressing Deficiencies:
   1. The SITA shall notify the Architect, Contractor and the Design Professional requiring the quality control, of observed deficiencies or non-conformance of work or products.
      a. A draft report of any deficiencies noted during inspections shall be provided to the Contractor on-site in writing (using the method(s) previously agreed to with the Contractor) before the special inspector leaves the site that day.
      b. A final report of inspections shall be issued within five (5) business days of on-site visits. A report of tests performed shall be issued within five (5) business days of performing tests.
   2. Re-inspection and/or re-testing required because of Contractor's non-conformance to the Contract Documents shall be performed by the SITA and shall be paid for by the Contractor. In the event that this occurs, the SITA shall invoice the Contractor directly unless the Owner has indicated it is acceptable to simply bill the Owner and make note that the Owner should be reimbursed for the additional services.

F. The SITA shall provide appropriate quality control staff on-site within five (5) business days of any request by the Contractor to perform inspections and tests required by Specification Section 01 4533, including any re-inspections, retests and/or repeat structural observations.
   1. The Contractor shall be responsible for requesting all site visits necessary for the SITA to perform all quality control services.
   2. If the Contractor does not request inspection, testing, and/or structural observation where required, the work that was not inspected, tested, and/or observed, shall be considered deficient.

G. The SITA shall issue a report to the Architect, Structural Engineer and Contractor if inspection and/or testing indicates that work conforms or does not conform with the contract documents.
   1. If work that is required to be inspected or tested is covered or made permanently inaccessible by the Contractor prior to inspection or testing by the SITA, it shall be assumed that the covered work is non-conforming.

H. The SITA shall comply with the requirements for issuing a Final Report of Special Inspections and Testing required by Section 01 4533.

1.11 QUALITY CONTROL OBSERVATIONS

A. General
   1. The Contractor shall notify every quality control observer (e.g. the CxA and every Design Professional) at least five (5) business days before project conditions are ready for every site visit to make observations that those individuals would like to make.
   2. Quality control observers shall be permitted to issue a written observation report or simply note items verbally in a conversation with any representative of the Contractor onsite. The Architect and/or the Contractor may request written observation reports; however, each Design Professional shall be the sole determinant of if or when written observation reports are issued.

B. Schedule of Site Visits

1. Before the Quality Control Pre-Construction Meeting, the Contractor shall request from the CxA and every Design Professional a description of project conditions which are associated with every desired site visit. (For example, the Structural Engineer may indicate that after rebar is installed for the first grade beam pour but before concrete is poured, he or she would like to send an Engineer-In-Training or an Observer to the site to make observations.)

C. Scope of Observations
   1. Site visits desired by Design Professionals but not specifically listed as required in Section 01 4533 are not code-required site visits (e.g. Structural Observations from regular visits by the Structural Engineer or his/her representatives are not the Code-Required Structural Observations listed in other portions of Section 01 4533).
   2. The observations are visual observations by the Design Professional, or their representative, of the systems which were designed by the Design Professional and are under construction or were recently constructed, for some verification that this work general conforms to the approved construction documents.
   3. The determination of which conditions to note during observation shall be made at the sole discretion of the Design Professional or their representative. These observations may be limited to clear indications noted in which the observer believes the Contractor misunderstood the design intent and the misunderstanding is about a significant requirement. The Design Professional shall not be responsible for identifying any and all significant deficiencies.
   4. In written observation reports, the Design Professional shall be permitted to identify certain conditions as “registered” (e.g. registered deficiency, registered observation, registered item, etc…) at the Design Professional’s discretion. The Contractor shall fully address all items noted, regardless of whether they are noted as registered or not; however, the Contractor shall provide the Design Professional with evidence that registered items have been fully addressed and ask the Design Professional if that evidence is sufficient, which provides a higher level of quality control.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 QUALITY CONTROL PRE-CONSTRUCTION MEETING

A. The Contractor shall schedule a "Quality Control Pre-Construction Meeting" with the SITA’s Construction Materials Engineer, CxA, Structural Engineer (or a representative of), and the Architect’s Construction Observer. Before scheduling the meeting, the Contractor shall ask the Owner if a representative of the Owner would like to attend. It shall be permitted for people to attend in person or by conference call. During this meeting:
   1. The Contractor shall review the approval status of the qualifications and scope statements from the SITA and CxA with all attendees.
   2. The Contractor shall acknowledge their responsibility to request site visits for all inspections and tests required by Specification Section 01 4533 before work is made inaccessible or covered. The Contractor shall also acknowledge their responsibility to address all deficiencies.
   3. The Contractor, SITA and CxA shall acknowledge their responsibilities to comply with the requirements for Final Reports of Quality Control from firms providing quality control service in Section 01 4533.
   4. The Contractor shall provide the construction schedule to all attendees. If this schedule changes during construction, the Contractor shall notify quality control personnel.
   5. The SITA and CxA shall summarize their understanding of how Specification Sections 01 1400 and 01 4533 shall be applied to this project.
   6. The Contractor shall summarize their understanding of when the Contractor is required to request SITA, CxA and Design Professional site visits for inspections and/or tests.

7. The Architect's Construction Observer shall determine if the site visits described for Design Professionals hired by the Architect generally comply with the Owner-Architect Agreement.
8. The Contractor shall acknowledge their obligation to notify Design Professionals how observations are addressed when observations are noted on reports as "registered".
9. The Contractor and SITA and shall determine collaboratively with each other a mutually agreed upon method for SITA technicians to provide the Contractor with written draft reports of any deficiencies before the technician leaves the site on the day the deficiencies are observed. This method shall not require Contractor's staff to be on-site to receive this draft report. As an example, this could include emailing a specified Contractor email address from smart phones or placing a hard copy of reports in a specified Contractor box outside the job trailer.
10. The SITA and CxA shall each determine collaboratively with the Contractor when the last report from each firm (regarding any portion of the project) is likely to be issued.

3.02 QUALITY CONTROL SPECIFIED BY THE DESIGN PROFESSIONALS

A. Within 7 days after the Foundation Pre-Construction Meeting, the Contractor shall notify the SITA of any special inspections and testing required by delegated design professionals. The SITA shall perform all quality control required by each delegated design professional (hired by the Contractor) to be performed by the SITA. The delegated design professionals shall require quality control that they, in their professional opinion, believe appropriate for the SITA to perform given the nature of the work with consideration given to their understanding of the local industry standard of care. Proposers (potential Contractors) shall assume for proposal purposes that each delegated design professional will require the full scope of special inspections and testing (and structural observation if applicable) listed in the material specific sections and tables of Chapter 17 of the IBC unless told otherwise by the delegated design professional before Proposers submit proposals.

B. Where special inspection and testing is specified by other design professionals (e.g. Architect, Structural Engineer, Civil Engineer, MEP Engineer, etc…) to be performed by the SITA for delegated design items, this work shall be performed at a minimum but shall not be a substitute for the quality control program required by the delegated design professional.

3.03 QUALITY CONTROL SPECIFIED BY THE STRUCTURAL ENGINEER

A. Scope: The quality control required by the Structural Engineer shall apply to all work sealed by the Structural Engineer of Record, the individual who sealed the "S" Sheets.

B. Special Inspections for Soils
   1. Reference SITA Scope on the Drawing Sheets: The SITA shall perform special inspection and testing of the soil below the carton void forms and the subgrade in the crawlspace as required by the Civil Engineer on the Civil Drawing sheets for general site grading and fill, with utility trench backfill as required by the Mechanical and Electrical Engineers on the MEP Drawing sheets as well as the Technology Consultant on the Technology Drawing sheets.
   2. Coordination with the Geotechnical Engineer: The SITA shall coordinate inspections and testing of soil with observations by the Geotechnical Engineer, regardless of whether the Geotechnical Engineering Firm is the same firm or a different firm from the SITA firm. The Contractor shall contact the Geotechnical Engineer before the Quality Control Pre-Construction Meeting to determine when the Geotechnical Engineer recommends observations and communicate the schedule on these Geotechnical observations to the SITA. The Contractor shall then notify the Geotechnical Engineer at the appropriate times so that the Geotechnical Engineer can make observations onsite. Where the Geotechnical Engineer recommends that the Geotechnical Engineer be onsite to confirm items (e.g. appropriate depth of a strata, appropriate condition of a strata, anticipated subsurface water conditions, etc…), the SITA shall not perform inspections and testing associated with those items until the Geotechnical Engineer has made such observations.

C. Deep Foundation Elements and Footings
   1. The SITA shall observe the installation of all deep foundation elements and/or footings and record all information necessary for the SITA to provide a reliable cost reconciliation by linear foot for each type of deep foundation element and cubic yard of excavation and reinforced concrete for footings. This information shall include the elevation of the grade at the time of drilling, which the SITA may obtain from the Contractor. This information shall also include the elevation of the the bottom of steel casing (or depth below grade at a known elevation), when casing is used. The SITA shall be the sole determinant in the field, for each deep foundation element and for all footings, when sufficient bearing material has been reached and the SITA shall identify for the Contractor, during drilling/excavation, the highest elevations that the SITA considers acceptable so as to assist the Contractor in minimizing work (especially work associated with a unit price adjustment). The SITA shall be the sole determinant in the field, for each deep foundation element, when casing is required and the SITA shall identify for the Contractor, during drilling, the fewest piers the SITA considers necessary to case and the highest elevations that the SITA considers acceptable for the bottom of casing at each pier so as to assist the Contractor in minimizing work (especially work associated with a unit price adjustment).
   2. After the Contractor indicates that the last Deep Foundation Element has been installed, the Contractor shall request a Deep Foundation Element Reconciliation Report from the SITA. The SITA shall then provide a tabulation of the difference between assumed and actual conditions for the total cumulative length of uncased deep foundation elements, and cased piers where applicable, for each diameter and reinforcement pattern. The Contractor shall then calculate the change in cost associated with the Pier Reconciliation Report from the SITA and then submit a Request for Information, asking the Architect and any appropriate Design Professionals to review the report and proposed cost change before a Proposed Cost Revision is submitted.

D. Special Inspections and testing for Augered cast-in-place (ACIP) piles
   1. The SITA shall perform the following quality control services related to the ACIP pile load tests specified in Section 31 6316 which shall be performed before the installation of any piles other than load test piles:
      a. Before installation of any ACIP Piles for load testing purposes, the SITA shall verify that the Geotechnical Engineer has approved in writing the quality assurance load testing program proposed by the Contractor. The SITA shall not be responsible for load testing installation and instrumentation.
      b. During installation of piles for load testing purposes, the SITA shall perform inspection and testing services for the test piles as required for all piles. If requested by the Contractor in an attempt to expedite the construction schedule, the SITA shall be permitted to test (at no cost to the Contractor) additional mortar cubes at dates requested by the Contractor.
      c. ACIP Pile Load tests may be performed when the grout is at least 7 days old or when the average grout strength of 3 prism has an average compressive strength that is at least 1,500 psi. The SITA shall obtain and test one set of 3 grout prisms to be tested at 7 days. The Contractor has the option to pay the SITA directly for additional grout prisms if it is desired to have additional testing performed earlier than 7 days.
      d. During the load testing procedure (loading and unloading), the SITA shall perform inspection services and record the load and displacement data as well as the time this data was recorded for each loading and unloading.
      e. The SITA shall issue a report of the pile load tests (e.g. pile characteristics to be recorded for all piles, load-displacement data and any concerns regarding pile installation or capacity). The SITA shall issue this report to the Contractor, Architect and Structural Engineer within two (2) business day of the Contractor completing pile load tests.

2. A representative of the SITA shall make continuous inspections to determine that the specified pile lengths are obtained.
3. SITA shall furnish complete pile log showing the diameter, top elevation of each pile, reinforcing steel cage length, quantity and size of bars, total depth of pile.
4. Each day of pumping grout, one set of 6 mortar cubes shall be prepared by the testing laboratory with 2 tested at 7 days, 2 tested at 28 days, and 2 held in reserve. At the Contractor's expense, the Contractor has the option to test additional cubes at any time to test them at earlier ages.
5. Fluidity of the grout shall be tested during installation using a 3/4 inch flow cone in accordance with ASTM C 939. The flow rate shall be between 15 and 25 seconds.
6. The SITA shall monitor and record the following:
    a. The amount of grout pumped for every pile installed.
    b. The volume of grout pumped per unit length of the pile.
    c. The rate and pressure at which the grout is pumped.
    d. The rate of drilling, auger withdrawal with respect to maintaining required grout pressure.
    e. Grout head and return depth as well as any inconsistencies during grouting.

E. Special Inspections and Testing for Concrete Construction
1. Before requesting that SITA personnel visit the site to make inspections of concrete work, the Contractor shall electronically send to the SITA any applicable reinforcement shop drawings and concrete mix design submittals that have been reviewed by the specifying Engineering Firm. The Contractor shall give the SITA sufficient time and lighting at the site, as deemed necessary by the SITA, to perform the specified inspections and testing.
2. The SITA shall provide the following inspections and testing for concrete construction.
    a. Before every concrete pour (generally the same day of the pour unless the SITA deems the scope of the pour to be too large), the SITA shall visit the site and inspect the reinforcement for conformance with the reviewed shop drawings, to the extent that the SITA deems appropriate under the supervision of the Construction Materials Engineer (e.g. yield strength, size, spacing, concrete cover, etc…at a random sampling to be determined by the SITA). While onsite, the SITA shall be empowered but shall not be obligated to make comments and/or ask questions during inspections regarding related conditions, including but not limited to anchor bolt embedment, steel embed plate type and location, formwork, concrete accessories, debris, etc.…
    b. During concrete pours, for each intended use (e.g. footing, grade beam, interior slab on grade, etc…), the SITA shall sample concrete from the first concrete truck on each day of concrete pouring and shall determine which other concrete trucks they will sample each day, if any. The SITA shall, however, sample trucks so that no more than 150 cubic yards of concrete is placed at a time without being sampled (e.g. sampling every 150 cubic yards). While onsite, the SITA shall be empowered but shall not be obligated to make comments during inspections regarding related conditions, including but not limited to unsafe conditions, age of concrete in trucks after batching before poured, vibration of concrete, hot weather and cold weather concrete placement methods, temperature and wind speed for the pour that day, and curing conditions for previously poured areas.
    c. For each truck that is sampled, the SITA shall do the following and notify the Contractor immediately of any deficiencies so that the Contractor has an opportunity to address those deficiencies:
        1) Collect a copy of the batch ticket and verify that the mix design matches the reviewed submittal for the intended use;
        2) Collect a sample in accordance with ASTM C172.
        3) Perform a slump test in accordance with ASTM C172 and verify that the slump is within the range on the submittal;

4) Perform an air content test in accordance with ASTM C231or ASTM C173 and verify the air content is within the range on the submittal;
5) Record the concrete temperature;
6) Fabricate cylinders molded and standard-cured in accordance with ASTM C31. Each set of cylinders shall consist of either four cylinders that are 6” in diameter and 12” tall or five cylinders that are 4” in diameter and 8’ tall. The Contractor shall be responsible for providing a portion of the site to the SITA for cylinder storage; however, the proper temperature and humidity of curing of all test cylinders and protection of curing on the jobsite shall be the responsibility of the SITA and not the Contractor. The SITA shall also be responsible for transportation from the field to the laboratory. All test cylinders shall be stored in the field 24 hours and then be carefully transported to the laboratory and cured in accordance with ASTM C31.
7) The Contractor shall have the option to pay the SITA to perform additional inspections and testing, such as additional concrete cylinders whenever desired to determine early strengths. The Contractor shall be responsible for any additional cylinders required to comply with OSHA requirements.

d. For each set of concrete cylinders fabricated, the SITA shall perform compression strength testing in accordance with ASTM C 39 with one (1) cylinder at 7 days and either two (2) 6” diameter cylinders or three (3) 4” diameter cylinders at 28 days. The SITA shall hold one cylinder in reserve and test the reserve cylinder at 56 days only if the average of the 28 day cylinder strengths is below the specified strength and the specifying Engineer indicates it is acceptable to test at 56 days rather than waiting a longer period of time.

F. Structural Observations for Concrete Construction:
1. A structural observer shall visit the site and make observations of concrete construction for each item indicated below to verify that concrete construction generally conform with the contract documents.
a. At the time the first DFE (i.e. Drilled pier) is placed
b. Prior to placing concrete for the first footing
c. Prior to placing concrete for the first grade beam or stem wall
d. Prior to placing concrete for the first of each type of slab (i.e. the first slab-on-grade, the first slab-on-void, the first slab over metal deck, the first shelter roof topping slab).

G. Special Inspections and Testing for Masonry Construction
1. Before requesting that SITA personnel visit the site to make inspections of masonry work, the Contractor shall electronically send to the SITA any applicable reinforcement shop drawings and mortar/grout mix design submittals that have been reviewed by the Structural Engineering Firm. The Contractor shall notify the SITA of the rate of masonry construction as it occurs so that the SITA is onsite the first day of structural masonry work and no more than 5,000 square foot of structural masonry is constructed at a time without the SITA being onsite for inspections and testing (e.g. notifying the SITA every 5,000 square feet). The Contractor shall also coordinate the SITA site visits such that structural masonry work is occurring (e.g. masons are installing masonry) when the SITA is performing inspections and tests. Structural masonry for the purposes of quality control is hereby defined as all reinforced concrete masonry walls which are exterior walls and load-bearing walls.
2. The SITA shall provide the following inspections and testing for masonry construction:
a. The first day of masonry work, the SITA shall observe the mason mixing the first batches of both mortar and grout, verifying the following (with the mason preparing a batch of mortar or grout for inspection purposes only, to be discarded, if no mortar or grout is needed that day):
1) the ingredients appear to be consistent with the reviewed mix submittals (e.g. the type of cementitious materials listed on bags appear correct);

2) the volumetric proportions are consistent with the reviewed mix submittals; and,
3) containers with known volume are used when batching (allowing the mason to assume that a bag of cement weighing at least 92 pounds is a cubic foot), verifying that shovels are not used when proportioning sand or gravel.

b. At every visit for inspections and testing of masonry construction, the SITA shall do the following:
1) Inspect bedjoint reinforcement and vertical as well as horizontal conventional reinforcement where work is exposed (i.e. constructed but not obstructed from view with grout or masonry) for conformance with the reviewed shop drawings, to the extent that the SITA deems appropriate under the supervision of the Construction Materials Engineer (e.g. yield strength, size, spacing, masonry cover, etc…at a random sampling to be determined by the SITA);
2) Inspect grout spaces to verify they are clear of debris;
3) Sample grout and fabricate a set of three (3) grout prisms (grout only, formed with CMU on all sides, and not a masonry prism which is constructed with two units and a mortar joint) and test in the lab at 28 days in accordance with ASTM C 1019. The Contractor shall be responsible for providing a portion of the site to the SITA for prism storage; however, the proper temperature and humidity of curing of all test prisms and protection of curing on the jobsite shall be the responsibility of the SITA and not the Contractor. The SITA shall also be responsible for transportation from the field to the laboratory.
(a) every time grout is sampled to make prisms, the SITA shall perform a slump test and verify that the slump is greater than 8”.
4) While onsite, the SITA shall be empowered but shall not be obligated to make comments and/or ask questions during inspections regarding related conditions, including but not limited to use of integral water repellant in mortar mixes where specified, mortar mixing, grout mixing, grouting where post-installed anchors will be required, anchor bolt embedment of embedded anchor bolts, steel embed plate type and location, masonry accessories, veneer anchors, debris, lift height for grouting, age or segregation of mortar or grout when placed, vibration, hot weather and cold weather practices, material certification for masonry units, proper face-shell bedding, bracing of previously constructed non-loadbearing masonry walls, and curing conditions for previously constructed walls.
5) Mortar cubes and masonry prisms are not required. If the SITA produces mortar cubes or masonry prisms without the Owner's authorization, the Owner will not pay for mortar cube preparation or mortar cube testing. The Contractor shall be permitted to request and pay for mortar cubes or masonry prisms, if the Contractor desires.

H. Structural Observations for Masonry Construction
1. A structural observer shall visit the site and make observations of reinforced concrete masonry unit (CMU) construction before the first grout pour to verify that CMU construction generally conforms with the contract documents.
2. Before every time the Contractor pours grout of any masonry that is indicated on the Structural drawings to be a part of or to be within the shelter envelope as defined by sheet G4.1, a Structural Observer shall verify the following:
a. Reinforcement generally conforms with the Structural drawings, including but not limited to rebar sizes, locations and proper splice lengths.
b. The grout spaces are clear of debris such that the grout coverage of the bars will comply with the project specifications.
c. Mortar joints extend the full width of the face shells.

d. The clear dimension between the rough openings of the masonry and any components such as doors, shutters, or storm louvers that penetrate the shelter envelope (as defined by sheet G4.1) are within permitted tolerances as indicated by the component manufacturer's instructions. Note that these tolerances are significantly more stringent than conventional ACI tolerances.

I. Special Inspections and Testing for Steel Construction

1. Before requesting that SITA personnel visit the site to make inspections of structural steel work, the Contractor shall electronically send to the SITA copies of the welding certifications for every steel welder that will be onsite, manufacturer certification for every adhesive anchor installer that will be onsite and any applicable structural steel submittals that have been reviewed by the Structural Engineering Firm. Upon receipt of the welding certifications, the SITA Staff shall verify these welders have passed qualification tests within the last year using procedures covered in the American Welding Society "Structural Welding Code - Steel," D1.1, latest version. Upon receipt of the adhesive anchor certifications, the SITA Staff shall verify these installers do not have an expired certification. The inspector (acting under the supervision of the Construction Materials Engineer) shall be permitted to accept alternative experience and/or on site demonstration of competency if qualified in the opinion of the inspector.
2. Inspection and Testing at Non-AISC Fabrication Shops: If any steel fabrication occurs off-site at a fabrication shop that is not an AISC certified fabrication shop (excluding Steel Joist Institute facilities manufacturing steel joists), the Steel Fabricator shall pay for the SITA to perform the special inspections or testing required by Section 01 4533 for all such off-site steel fabrication. The Contractor shall notify the SITA when fabrication of steel is scheduled to begin at these facilities. The SITA shall visit these facilities at the beginning of steel work within those facilities and review the quality assurance / quality control documentation at that facility (e.g. processes, welder certifications, logs of welding inspections, etc…). The SITA Staff, acting under the supervision of the Construction Materials Engineer, shall then determine how much (if any) of the specified inspection and testing for on-site steel construction shall apply to the non-AISC-certified shop construction, and then perform that scope of work after communicating to the Contractor when the SITA is to be notified for inspections at the shop. For proposal purposes, Steel Fabricators with non-AISC shops shall assume that the SITA Staff will require the full scope of inspection and testing for on-site steel construction shall apply to the non-AISC-certified shop construction.
3. On-Site Inspection and Testing: The Contractor shall notify the SITA of the status of steel construction as it occurs so that the SITA is onsite after defined areas of the structural steel portion of the project are complete (with the exception that the SITA must be present during the installation of any overhead adhesive anchors), notifying the SITA of any work within those areas that is to be completed at a later date. The Contractor shall not cover up portions of steel construction until the SITA has performed quality control services without identifying any deficiencies at those areas. By the end of the project, the Contractor shall have scheduled visits from the SITA for steel inspection and testing of all structural steel construction (including all miscellaneous steel members but not including cold formed metal framing) that occurred on-site. During each sitevisit, the SITA shall do the following:
    a. Verify off-site fabrication occurred at an AISC certified fabrication shop (by obtaining a copy of the shop's certificate), unless the SITA has provided the specified inspection and testing services at the fabrication shop.
    b. Structural Steel Members: Verify that the structural steel framing member sizes and locations generally conform to the reviewed steel submittals.

c. Welds that are not Full Penetration welds: Out of all the welds in the area defined by the Contractor as being ready for inspection, the SITA Staff shall determine how many and which welds to visually inspect (acting under the supervision of the Construction Materials Engineer). At a minimum, the SITA shall inspect at least 10% of each type of weld. The SITA shall be permitted to inspect up to 100% of each type of weld if the SITA Staff believe appropriate, based on the conditions observed. The Contractor shall clean all welds identified for visual inspection by the SITA. Visual inspection of welds shall include but not be limited to alignment of members, weld size, length, location, weld/base-metal fusion and signs of cracking.

d. Welds that are Full Penetration welds:
   1) the Contractor shall clean all full-penetration welds. The SITA Staff shall visually inspect all full-penetration welds.
   2) out of all the full-penetration welds in the area defined by the Contractor as being ready for inspection, the SITA Staff shall determine how many and which welds receive Ultrasonic Testing (acting under the supervision of the Construction Materials Engineer). At a minimum, the SITA shall perform Ultrasonic Testing on at least 10% of each type of full-penetration weld (e.g. normal full-penetration, flare vee, etc…). The SITA shall be permitted to perform Ultrasonic Testing on up to 100% of each type of full-penetration weld if the SITA Staff believe appropriate, based on the conditions observed.

e. Bolts:
   1) Load-Indicator Type Bolts: Out of all the load-indicator bolts in the area defined by the Contractor as being ready for inspection, the SITA Staff shall determine how many and which load-indicator bolts receive inspection and testing (acting under the supervision of the Construction Materials Engineer). At a minimum, the SITA shall visually inspect at least 10% of each type of load-indicator bolt. The SITA shall be permitted to visually inspect up to 100% of the load-indicator bolts if the SITA Staff believe appropriate, based on the conditions observed. Visual inspection and testing of load-indicator bolts shall include verification that the grade, diameter, location, and minimum length generally conform with the reviewed steel submittals, and that the splines have been snapped off to indicate proper torquing. If any steel to steel connections do not utilize load-indicator type bolts, this section shall apply.
   2) Anchor Bolts that are not Overhead Adhesive Anchor Bolts: Out of all the anchor bolts (including base plate anchor bolts, expansion bolts, and adhesive anchor bolts but excluding overhead adhesive anchor bolts) in the area defined by the Contractor as being ready for inspection, the SITA Staff shall determine how many and which anchor bolts receive inspection and testing (acting under the supervision of the Construction Materials Engineer). At a minimum, the SITA shall visually inspect at least 10% of each type of anchor bolts. The SITA shall be permitted to visually inspect up to 100% of the anchor bolts if the SITA Staff believe appropriate, based on the conditions observed. Visual inspection and testing of anchor bolts shall include verification that the bolts are snug tight in the opinion of the SITA, wedge anchors are fully torqued and no longer able to rotate, and verification that the grade, diameter, location, and minimum length beyond the nut generally conform with the reviewed steel submittals.
   3) Overhead Adhesive Anchors: The SITA Staff shall be present during the installation of all adhesive anchors oriented vertically such that the anchors are in tension, if there are any such anchors on the project. During the installation, the SITA shall visually inspect the bolts as with all other anchor bolts and inspect the installation, commenting if the installation does not appear to be consistent with the manufacturer’s recommended installation procedures.

f. Metal Deck: For all metal deck, verify the type, gauge, finish, weld pattern and sidelap connections conform with the reviewed deck submittals.

g. While onsite, the SITA shall be empowered but shall not be obligated to make comments and/or ask questions during inspections regarding related conditions, including but not limited to unsafe conditions, counterfeit steel members and/or bolts, galvanized steel being cut/scratched/welded (which is not permitted), exterior exposure of non-galvanized material that is not to be painted, welding procedures, steel angle supports around openings in metal deck, deck closures, fire protection, removal of backer plates, grinding of exposed welds, temporary or permanent bracing, and visual acuity of welders.

J. Structural Observations for Steel Construction
1. After construction of all cold-formed metal framing (CFMF) for premanufactured covered walkways, a Structural Observer shall verify that all framing and connections generally conform with the sealed shop drawings provided by the Contractor's engineer and approved by the Architect.
2. After construction of all structural steel, or prior to placing the first elevated floor slab, whichever comes first, a Structural Observer shall visit the site and make observations that all steel members (steel columns, steel beams, steel joists, steel decking, etc.) generally conform with the contract documents.

3.04 QUALITY CONTROL SPECIFIED BY THE CIVIL ENGINEER

A. Reference Civil drawings for quality control required by the Civil Engineer.

3.05 QUALITY CONTROL SPECIFIED BY THE ARCHITECT

A. Special Inspections for Sprayed Fire Resistant Materials
1. Sprayed Fire Resistant Materials, General:
a. Verify compliance of sprayed-fire resistant materials with specific fire-rated assemblies shown in the approved contract documents.
b. Perform special inspections after rough installation of electrical, mechanical, plumbing, automatic fire sprinkler and suspension systems for ceilings.
2. Physical and visual tests: Verify compliance with fire resistance rating.
a. Condition of substrates; periodic
b. Thickness of sprayed fire resistant material; periodic.
c. Density of sprayed fire resistant material in pounds per cubic foot; per model building code.
d. Bond strength (adhesion and cohesion); per model building code.
e. Condition of finished application; per model building code.
3. Structural member surface conditions:
a. Inspect structural member surfaces before application of sprayed fire resistant materials; periodic.
b. Verify preparation of structural member surfaces complies with approved contract documents and manufacturer's written instructions; periodic.
4. Application:
a. Ensure minimum ambient temperature before and after application complies with the manufacturer's written instructions; periodic.
b. Verify area where sprayed fire resistant material is applied is ventilated as required by the manufacturer's written instructions during and after application; periodic.
5. Thickness: Verify that no more than 10 percent of thickness measurements taken from sprayed fire resistant material are less than thickness required by fire resistance design in approved contract documents. In no case shall the thickness of the sprayed fire resistant material be less than the minimum below.
a. Minimum Allowable Thickness: Tested according to ASTM E605, random.
1) Design thickness 1 inch or less: Design thickness minus 1/4 inch.
2) Design thickness greater than 1 inch: Design thickness minus 25 percent.

b. Floor, Roof and Wall Assemblies: Test thickness according to ASTM E605 with no less than four measurements per 1,000 square feet of sprayed area on each story of the structure or portion thereof; random.
   1) Cellular Decks: Measure thickness within a single 12 inch by 12 inch area. Make a minimum of four measurements arranged symmetrically in testing area.
   2) Fluted Decks: Measure thickness within a single 12 inch by 12 inch area. Make a minimum of four measurements arranged symmetrically in testing area and include one example each of valley, crest and sides. Report the average of the four measurements.

c. Structural Members: Test according to ASTM E605. Test no less than 25 percent of structural members on each story of the structure or portion thereof; random.
   1) Beams and girders: Make nine thickness measurements around beam or girder at each end of a 12 inch by 12 inch length.
   2) Joists and trusses: Make seven thickness measurements around joist or truss at each end of a 12 inch by 12 inch length.
   3) Wide flanged columns: Make twelve thickness measurements around column at each end of a 12 inch by 12 inch length.
   4) Hollow structural sections and pipe columns: Make four thickness measurements around hollow structural section or pipe column at each end of a 12 inch by 12 inch length.

6. Density: Verify density of sprayed fire resistant material is no less than density required by the fire resistance design in the approved contract documents.
   a. Floor, Roof and Wall Assemblies: Test according to ASTM E605 with no less than one sample per 2,500 square feet of sprayed area on each story of the structure or portion thereof; random.
   b. Beams, Girders, Trusses and Columns: Test according to ASTM E605 with no less than one sample per 2,500 square feet of sprayed area on each story of the structure or portion thereof; random.
7. Bond Strength: Verify adhesive and cohesive bond strength of sprayed fire resistant materials is no less than 150 pounds per square foot when in-place samples of the cured material are tested according to ASTM E736 and as described below.
   a. Floor, roof and wall assemblies: Test no less than one sample per each 2,500 square feet of sprayed area on each story of the structure or portion thereof; random.
   b. Structural members: Test no less than one sample from each type of structural member in each 2,500 square feet of each story of the structure or portion thereof; random.
   c. Primer, paint and encapsulant bond tests: When sprayed fire resistant material is applied to a primed, painted or encapsulated surface for which acceptable material to substrate performance has not been determined, conduct bond test.

B. Special Inspections for Mastic and Intumescent Fire Resistant Coatings
   1. Verify mastic and intumescent fire resistant coatings comply with AWCI 12-B and the fire resistance rating shown on the approved contract documents.

C. Special Inspections for Firestopping Penetrations and Joints
   1. Before the installation of any firestopping at penetrations and joints, the SITA shall verify that the installer of firestopping at penetrations and joints is an FM4991 “Approved Standard for Firestop Contractors” approved firestop contractor or UL Qualified Firestop Contractor.

2. The SITA shall inspect firestopping at penetrations in accordance with ASTM E 2174 “Standard Practice for On-Site Inspection of Installed Fire Stops” for each type of firestop being used. A unique “type” shall be defined by the UL Fire Resistance Directory utilizing UL’s alpha-alpha-numeric numbering system based on a specific combination of penetrant, substrate and firestop product. For each type of penetration, inspections shall be by either witnessing the entire installation of 10% of the penetrations. Alternatively, for each type of penetration that is not a pre-formed firestopping penetration device, inspections shall be permitted to be by the SITA removing a portion of the firestopping at 2% of the penetrations, verifying the proper depth of installation (and compression at mineral wool, if applicable) and the firestopping installer replacing the firestopping in the presence of the SITA. For preformed-devices, the inspection shall be either by witnessing 10% of the installation of each type of firestop, or alternatively by a post-installation verification that the installed system complies with the reference listed system or engineering judgment. If non-compliant conditions are encountered by the SITA, the SITA shall proceed as directed by ASTM E 2174.
3. The SITA shall inspect firestopping at joints in accordance with ASTM E 2393 “Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers” for each type of firestop being used. A unique “type” shall be defined by the UL Fire Resistance Directory utilizing UL’s alpha-alpha-numeric numbering system based on a specific combination of joint type (head of wall, wall to wall, floor to wall, floor to floor, floor to exterior wall) firestopping material or system (for example, intumescent, caulk, mortar, sealant, mechanical, factory preassembled), and substrates (for example, gypsum wall, concrete floor, composite floor deck). For each type of joint, inspections shall be by either witnessing 5% of the total lineal feet to be installed on the project. Alternatively, inspections shall be permitted to be by the SITA removing at least 1 foot every 500 linear feet of the firestopping on the project, verifying the proper depth (and compression at mineral wool, if applicable) of installation and the firestopping installer replacing the firestopping in the presence of the SITA, or in the case of a pre-formed firestopping joint device, by verifying that the device has been installed in accordance with the reference listed system or engineering judgment. If non-compliant conditions are encountered by the SITA, the SITA shall proceed as directed by ASTM E 2393.
4. If at any time, material removed by the SITA from penetrations and/or joints for a type does not conform to the project requirements, the SITA shall double the amount of destructive testing for that type unless the penetrations and joints were installed by SITA witnessing installation. Further non-compliance shall be addressed as directed by ASTM E 2174 and/or ASTM E 2393. If at any time, installation of firestopping at penetrations and/or joints does not conform with the contract documents while being witnessed by the SITA inspector, the SITA inspector is to proceed as directed by ASTM E 2174 and/or ASTM E 2393. Non-compliance according to these ASTM’s may lead to work stoppage that requires approval by the AHJ to resolve the non-compliance.

3.06 QUALITY CONTROL SPECIFIED BY THE MECHANICAL AND ELECTRICAL ENGINEERS

A. The CxA shall visit the site to make observations as specified by Section 01 9100, Section 01 4533 and Divisions 22-26.

3.07 FINAL QUALITY ASSURANCE REPORTS

A. General
   1. Before applying for a Certificate of Occupancy, the Contractor shall obtain a Final Report from each of the following quality control firms and submit them all at one time to the AHJ:
      a. SITA, Final Report of Special Inspections and Testing
      b. CxA, Final Report of Commissioning
      c. Structural Engineer, Final Report of Structural Engineering Observations
      d. Mechanical Engineer, Final Report of Mechanical Engineering Observations
      e. Electrical Engineer, Final Report of Electrical Engineering Observations

2. Quality assurance personnel shall not be required by the AHJ to issue any certifications, guarantees, or warranties because that is not in their scope of work. Specific language or formatting of the final report shall not be considered a requirement by the AHJ for this project unless the AHJ indicates otherwise before a building permit is issued. (If specific language is desired, quality assurance personnel would need to understand that specific language before performing their scope of work to ensure that they can accurately write a letter with that language.)
3. The Final Report from every firm providing quality control services shall be sealed by a Professional Engineer licensed in the State of Texas and shall indicate, if it is true, that the author of the Final Report:
    a. Represents the firm, identifying which quality control services were provided by that firm,
        1) Has reviewed all previous reports and believes all of the quality control services required by Section 01 4533 to be performed by their firm have been performed,
        2) Has reviewed all previous reports and believes there are no unresolved deficiencies, and,
        3) To the best of his or her knowledge, regarding the portion of the project associated with their scope of work, they believe the construction conforms.
            (a) The SITA shall indicate they believe the results of inspections and testing were within project specifications.
            (b) Quality control observers shall indicate they believe the construction generally conforms with the contract documents.
4. An example of acceptable language in a Final Report is as follows:
    a. For the SITA: “I am the Construction Materials Engineer representing [insert SITA firm’s name], which was responsible for providing Special Inspections and Testing Agency (SITA) services for the [insert project name] located at [insert project address], Huckabee project number [insert project number]. I have reviewed all previous reports from our firm and believe all of the quality control services required by Section 01 4533 of the Project Manual to be performed by the SITA have been performed. I have also reviewed all previous reports from our firm and believe there are no unresolved deficiencies. To the best of my knowledge, regarding the portion of the project associated with our firm’s scope of work, I believe the results of inspections and testing were within project specifications.”
    b. For the CxA: “I am the individual representing [insert CxA firm’s name], which was responsible for providing Commissioning (CxA) services for the [insert project name] located at [insert project address], Huckabee project number [insert project number]. I have reviewed all previous reports from our firm and believe all of the quality control services required by Section 01 4533 of the Project Manual to be performed by the CxA have been performed. I have also reviewed all previous reports from our firm and believe there are no unresolved deficiencies. To the best of my knowledge, regarding the portion of the project associated with our firm’s scope of work, I believe the construction generally conforms with the contract documents.”
    c. For the Structural Engineer, Mechanical Engineer and Electrical Engineer: “I am the [insert project role] representing [insert firm’s name], which was responsible for providing observations for the [insert project name] located at [insert project address], Huckabee project number [insert project number]. I and/or a representative of my firm visited the site at certain stages of construction and made observations. The Contractor is obligated to address all of my observations and has indicated to me that this was done. Therefore, to the best of my knowledge, I believe the construction related to my role generally conforms with the contract documents.”

B. Request for Final Report

1. Within 48 hours of receiving the last inspection, test or observation report expected for the project (regarding any portion of the project) from each firm providing quality control services, the Contractor shall issue an RFI requesting a Final Report of Quality Control from that firm. For clarification, the Contractor shall not be permitted to wait until the end of the project or even until all quality control firms have completed their work. The Contractor shall be responsible for addressing any unresolved deficiencies and submit a written statement to all quality assurance observers in the RFI that their observations were fully addressed before requesting this report from each firm. For proposal purposes, the Contractor shall assume that within ten (10) business days each firm providing quality control services will either issue this report without any unresolved deficiencies or identify in writing any known but unresolved deficiencies. If any unresolved deficiencies are identified during this process, the Contractor shall address these deficiencies and then request a final report again.
2. When the Contractor requests a Final Report of Quality Control from each quality control firm, quality control personnel shall verify that the scope of quality control services required by Specification Section 01 4533 was performed and that any deficiencies identified have been addressed.
    a. If it appears there are no unresolved deficiencies, the firm shall create and distribute a Final Report within ten (10) business days of receiving the request from the Contractor for the final report. The final report shall be sealed by a professional engineer licensed in the state of Texas and shall be distributed to the Contractor and the Architect.
    b. If the firm determines that there are unresolved deficiencies, the firm shall notify the Contractor within ten (10) business days of receiving the request from the Contractor for the Final Report that a Final Report cannot be provided until all unresolved deficiencies are resolved. It is preferred but not required that the firm also provide the Contractor a complete list of all deficiencies identified by the firm to date.

END OF SECTION

SECTION 01 5000
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary utilities.

B. Temporary sanitary facilities.

C. Temporary Controls: Barriers, enclosures, and fencing.

D. Security requirements.

E. Vehicular access and parking.

F. Waste removal facilities and services.

G. Project identification sign.

H. Field offices.

1.02 RELATED REQUIREMENTS

A. Section 01 2100 - Allowances

1.03 TEMPORARY UTILITIES

A. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes including review and inspection of work.

B. New permanent facilities may not be used.

1.04 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

B. Use of existing facilities is not permitted.

C. New permanent facilities may not be used during construction operations.

D. Maintain daily in clean and sanitary condition.

E. At end of construction, return facilities to same or better condition as originally found.

1.05 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas.Protect existing facilities and adjacent properties from damage from construction operations and demolition. Implement safety precautions that comply with all regulatory requirements.

B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.

C. Provide protection for plants designated to remain. Replace damaged plants.

D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.06 FENCING

A. Construction: Commercial grade chain link fence.

B. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks.

C. On sites where students are present, no work shall commence prior to fence being in place.

1.07 EXTERIOR ENCLOSURES

A. Provide temporary weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.08 SECURITY

A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

B. Coordinate with Owner's security program.

1.09 VEHICULAR ACCESS AND PARKING

A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.

B. Coordinate access and haul routes with governing authorities and Owner.

C. Provide and maintain access to fire hydrants, free of obstructions.

D. Provide means of removing mud from vehicle wheels before entering streets.

E. Designated existing on-site roads may be used for construction traffic.

F. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

G. Do not allow vehicle parking on existing pavement.

1.10 WASTE REMOVAL

A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

B. If materials to be recycled or re-used on the project must be stored on-site, provide suitable and secure non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

C. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.11 PROJECT IDENTIFICATION

A. No later than ten (10) days after the Notice to Proceed, and prior to start of construction, provide a job sign at the job site.

B. Request sign layout and details from the Architect.

C. Reference Section 01 2100 - Allowances for cash allowance for project sign.

D. Contractor shall be responsible to pick up sign.

E. Provide project identification sign of design and construction indicated on drawings.

F. Erect on site at location indicated.

G. No other signs are allowed without Architect's permission except those required by law.

1.12 FIELD OFFICES

A. Office: Weathertight, with lighting, electrical outlets, heating, cooling and ventilating equipment, and equipped with sturdy furniture .

B. Provide space for Project meetings, with table and chairs to accommodate 6 persons.

C. Provide separate work station similarly equipped and furnished, for use of Architect..

D. Locate offices a minimum distance of 50 feet from existing and new structures.

1.13 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to final punch list and review inspection.

B. Remove underground installations to a minimum depth of 3 feet. Grade site as indicated.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore existing facilities used during construction to original condition.

E. Restore new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 5719
INDOOR AIR QUALITY CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Construction procedures to promote adequate indoor air quality after construction.

B. Testing indoor air quality before commencement of construction; existing building areas only.

C. Testing indoor air quality after completion of construction.

1.02 PROJECT GOALS

A. 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.

B. 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.

1.03 REFERENCE STANDARDS

A. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size; 2017.

B. ASHRAE Std 129 - Measuring Air-Change Effectiveness.; 1997 (Reaffirmed 2002).

C. ASTM E779 - Standard Test Method for Determining Air Leakage Rate by Fan Pressurization; 2010.

D. SMACNA (OCC) - IAQ Guidelines for Occupied Buildings Under Construction; 2007.

1.04 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.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Indoor Air Quality Management Plan: Describe in detail measures to be taken to promote adequate indoor air quality upon completion; use SMACNA (OCC) 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.

C. 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.

D. Duct and Terminal Unit Inspection Report.

E. Indoor Air Quality Testing 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.

F. Indoor Air Quality Testing Reports: Show:
1. Location where each sample was taken, and time.
2. Test values for each air sample.
3. HVAC operating conditions.
4. Certification of test equipment calibration.
5. Other conditions or discrepancies that might have influenced results.
6. Interpretation of test results.
7. Recommendations for improvement of indoor air quality or retesting.

1.06 QUALITY ASSURANCE

A. Firm Qualifications: The indoor air quality testing firm must have a minimum of five years experience specifically in the indoor environmental quality field and must have indoor environmental testing and consulting capabilities. Firm should be a licensed mold assessment company (ACO) through the Texas Department of Licensing and Regulation (TDLR), and should have a minimum of one mold assessment consultant (MAC) on staff. Additionally, the firm's consultants should maintain current certification in indoor environmental consulting (i.e. Certified Indoor Environmental Consultant (CIEC) through the American Council for Accredited Certification (ACAC) or other certifying association. The firm should employ a LEED-Accredited Professional, certified by the United States Green Building Council (USGBC).

B. Laboratory Qualifications: The microbiology testing laboratory utilized by the consulting firm should have a minimum of five years experience, be a licensed mold analysis laboratory through the Texas Department of Licensing and Regulation (TDLR), and should employ a degreed mycologist. The industrial hygiene laboratory utilized by the consulting firm should have a minimum of five years experience, and be accredited by the American Industrial Hygiene Association (AIHA).

PART 2 PRODUCTS

2.01 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 Std 52.2.

PART 3 EXECUTION

3.01 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. Provide pre-construction air filters to all return air registers in adjacent occupied areas.

E. Use of HVAC equipment and ductwork for ventilation during construction is not permitted:
   1. Provide temporary ventilation equivalent to 1.5 air changes per hour, minimum.
   2. Exhaust directly to outside.
   3. Seal HVAC air inlets and outlets immediately after duct installation.

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 (OCC) for avoiding unnecessary contamination due to construction procedures.

3.02 INDOOR AIR QUALITY TESTING (IAQ)

A. On-site Observations
   1. A minimum of two (2) visits for renovations and up to six (6) site visits for new construction will be made to the site to conduct on-site observations during the construction phase relative to water intrusion issues or other building conditions that might cause future degradation to indoor air quality. These observations may include but are not limited to landscape grade and drainage, foundation height, exterior wall sealing, roof and wall enclosure penetrations, water or moisture intrusion, plumbing, storage and condition of absorbent building materials, sealing and hygiene of HVAC systems, control of particulates, etc.
   2. This phase may also include a review of specifications for building products such as paint, adhesives, carpet, and cabinetry for products that might degrade future indoor air quality when installed.
   3. A written report will be submitted to the Architect or Owner's representative after each on-site observation. The report will include project conditions on the day of inspection along with cited potential problems areas and photo-documentation as needed.
      a. Critical Condition Report: If a condition is cited that may cause potential microbial contamination in area that is ready to be sealed or covered, a verbal report will be communicated to the Architect or Owner's representative within one business day so the Contractor can have the condition corrected before work is continued.
      b. Standard Report: A written report will be submitted to the Architect or Owner's representative within ten (10) working days of the site visit.

B. Pre-Construction Inspection and Sampling: Perform indoor air quality testing before starting construction, as base line for evaluation of post-construction testing.

1. If the construction project is an addition to an existing facility, pre-construction inspection and sampling will be conducted to determine baseline conditions within the existing facility.
2. The testing conducted in item C-2 of the pre-occupancy testing below will be conducted in areas of the existing facility that will be adjoining the new construction.
3. During construction activities on-site observations will include any impact to the indoor air quality of the existing facility.

C. Pre-Occupancy Inspection and Sampling: Perform indoor air quality testing before occupancy.
1. After substantial completion of the facility and before non-fixed furnishings are delivered, the firm will conduct an IAQ inspection and perform representative sampling for indoor air quality parameters. These measurements will establish background pre-occupancy conditions, and will be evaluated for acceptable levels. All samples collected will be area screening samples to determine the presence of the parameters of interest. If the screening results indicate significant positive results, additional investigation may be required.
2. The air quality sampling includes the collection of samples for the determination of populations and concentrations of total fungal bioaerosols in the ambient air. The sampling also includes the collection of chemical samples for fixed gas analysis for total volatile organic compounds (TVOCs), methane, carbon dioxide, and carbon monoxide. Additional real-time monitoring will be conducted for the following parameters: temperature, relative humidity, carbon dioxide, carbon monoxide, TVOCs, ozone, and large (2.5 to 10 microns) and small particulates (<2.5 microns).
3. Testing in a school facility will include the collection of samples in representative areas of the classroom wings (to include a minimum of 20% of the classrooms), and if part of the new construction, in the cafeteria, library, administration offices, gymnasium, and locker rooms. Additionally, two outdoor samples will be collected on each day of testing for comparison purposes.
4. If significant areas of rubber-backed carpeting and/or composite fixed furnishings are present in the facility, testing will also be conducted in representative areas for 4-phenylcyclohexene and formaldehyde in the ambient air. This testing will not be conducted if carpeting and fixed furnishings have been installed which are certified to be free of these chemicals.
5. Testing for radon should be conducted only for subterranean structures or in geographical areas where radon has been previously documented on a reoccurring basis.
6. Testing for lead-based paint and asbestos-containing materials will not be conducted unless there is an indication that lead-based paint and/or asbestos-containing materials may be present in the existing structure, and that it may be impacted by the new construction activities. Historical asbestos testing records, asbestos management plans, or lead-based paint surveys may be provided in lieu of testing.
7. A report of findings and any recommendations will be provided within fifteen (15) working days of the sampling event.

D. Do not start pre-occupancy indoor air quality testing until:
1. All construction is complete, including interior finishes.
2. HVAC systems have been tested, adjusted, and balanced for proper operation.
3. Cleaning of inside of HVAC ductwork, if specified elsewhere, has been completed.
4. New HVAC filtration media have been installed.

E. Post-Occupancy Inspection and Sampling:
1. At five (5) months and eleven (11) months following substantial completion, but prior to the one (1) year project inspection, the testing conducted in item C-2 of the pre-occupancy testing above will be repeated.
2. A report of findings and any recommendations will be provided within fifteen (15) working days of the sampling event.

F. Indoor Air Quality Acceptance Criteria
   1. Upon completion of the project, the indoor air quality testing firm will provide a report of findings to the Architect or Owner's representative indicating any IAQ parameters that do not meet the acceptance criteria.
   2. The following criteria will be used to determine acceptance:
      a. Fungal Bioaerosols - measure in relation to outdoor air, generally not higher than outdoor air, and containing indoor populations and concentrations of fungi that are considered normal and typical. Use professional judgment of testing firm.
      b. Carbon Monoxide - measure in ppm, in relation to outdoor air. Not more than 2 ppm over outdoor air levels, and less than 9 ppm.
      c. Carbon Dioxide - measure in ppm, in relation to outdoor air. Not more than 700 ppm higher than outdoor air.
      d. Methane - measure in ppm. Not more than 5 ppm.
      e. Total Volatile Organic Compounds (TVOCs) - measure in ppm as methane, or micrograms per cubic meter (µg/m3) - not more than outdoor air, and less than 5 ppm (calculated as methane) or 3,000 µg/m3.
      f. Total Particulates - measure in total particle counts per cubic foot - total particle counts generally less than one-half (1/2) of outdoor air. Particle counts broken down to small (<2.5 microns) and large (2.5 to 10 microns).
      g. Radon - less than 2 picoCuries per liter (pCi/L).
      h. Ozone - nor more than outdoor air, and less than 0.1 ppm.
      i. Formaldehyde - measure in parts per million (ppm) - less than 0.050 ppm.
      j. 4-Phenylcyclohexene(if rubber-backed products) - measure in micrograms per cubic meter (µg/m3) - not more than 6.5 µg/m3.
      k. Lead - have paint supplier or contractor provide documentation of lead-free paint.

G. If air samples show concentrations higher than those specified, ventilate with 100 percent outside air and retest at no cost to Owner.

END OF SECTION

SECTION 01 6000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General product requirements.

B. Re-use of existing products.

C. Transportation, handling, storage and protection.

D. Product option requirements.

E. Substitution limitations.

F. Procedures for Owner-supplied products.

G. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

A. Section 01 4000 - Quality Requirements: Product quality monitoring.

1.03 REFERENCE STANDARDS

A. 16 CFR 260.13 - Guides for the Use of Environmental Marketing Claims; Federal Trade Commission; Recycled Content; Current Edition.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

A. Shop drawings, product data, and samples under provisions of Section 01 3000.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.

B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.

C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

D. Specific Products to be Reused: The reuse of certain materials and equipment already existing on the project site is not prohibited.
   1. If reuse of other existing materials or equipment is desired, submit substitution request.
   2. All items called for on the drawings to be salvaged, removed and relocated shall be inventoried, removed and stored until such time as they are to be installed in their new location. The inventory list shall be given to the Owner and shall include an itemized list that includes quantities, descriptions and condition of each item. These items are considered to be in good operating condition at the time the contract is signed, and shall remain the property of Owner. These items shall be properly protected by the contractor and removed by him, complete, including all appurtenances and reinstalled in their new location in good working order with any modifications called for by the drawings.

2.02 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by Contract Documents.

B. Where other criteria are met, Contractor shall give preference to products that:
   1. Are extracted, harvested, and/or manufactured closer to the location of the project.

2. Have longer documented life span under normal use.
3. Are made of recycled materials.
4. If made of wood, are made of sustainably harvested wood, wood chips, or wood fiber.

C. Provide interchangeable components of the same manufacture for components being replaced unless noted otherwise in the contract documents.

2.03 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.04 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver to Project site and place in location as directed; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION PROCEDURES

A. All substitutions shall be submitted on the Architects form as described in paragraph 3.03.

B. Product Substitution - Prior to Bid
1. No products shall be used on the project unless they are specified or have received prior approval.
2. Products to be reviewed prior to bid shall be submitted and reviewed under the provisions of this section.
3. Substitution request including all required documentation must be delivered to the Architect’s office no later than ten (10) calendar days prior to the proposal date designated in the project manual. Requests submitted late will not be considered.
4. No product will be considered “as equal” to the product specified until it has been included as an allowable substitution, in a written Addendum to the project.

C. Product Substitution - Post Contract Award
1. Product substitutions are not allowed except for the following provisions:
   a. Product is required for compliance with interpretation with code compliance.
   b. Product specified is unavailable.
   c. Product proposed will provide a credit to the Owner.
      1) Contractor shall provide amount of proposed savings on the substitution request form.
   d. Product proposed will provide a substantial benefit to the Owner’s schedule.
      1) Contractor shall clearly delineate the positive impact to the project schedule.
   e. Product supplier contractor default.
      1) Written documentation will be required to substantiate request.
2. Substitution request including all required documentation must be delivered to the Architect’s office no later than fifteen (15) calendar days after execution of the Contract.
3. Reimbursement of Architect's costs
   a. In the event substitutions are proposed to the Architect after the Contract has been awarded, the Architect will record all time used by him and by his consultants in evaluation of each such proposed substitution.
   b. Whether or not the Architect approves a proposed substitution, the Contractor promptly upon receipt of the Architect's billing shall reimburse the Architect at the rate of two and one-half times the direct cost to the Architect and his consultants for all time spent by them in evaluating the proposed substitution.

3.02 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Proposed product substitution shall comply with all applicable codes. Products not conforming to codes shall be removed and replaced at Contractors expense.

B. Coordination of substitutions:
   1. Prior to each product substitution, carefully review and coordinate all aspects of each item being submitted.
   2. Verify that each item and the submittal for it conform in all respects with the specified requirements.
   3. By submitting the substitution request form with each submittal, the contractor certifies that this coordination has been performed.

C. Substitutions:
   1. The Contract is based on the standards of quality established in the Contract Documents.
   2. Products specified by reference to standard specifications such as ASTM and similar standards do not require further approval.
   3. Do not substitute materials, equipment, or methods unless such substitution has been specifically approved in writing for this Work by the Architect.

D. Coordination of Materials and Installation
   1. General contractor shall install all fire protection, electrical and data wiring in conduit as high as possible and above mechanical ductwork. General contractor shall install all fire protection, electrical, data, and wiring in conduit in areas designated on the plans while coordinating structure, mechanical equipment/ductwork, lighting, building controls, and architectural systems. The proposed layout of these systems and conduit shall be reviewed with and accepted by the architect prior to installation. Systems and conduit shall group in the area designated by the construction documents in an orderly and clean installation. Final locations and conditions of these systems and conduit shall only be accepted by the architect upon review after installation.

E. Miscellaneous Materials
   1. If proposed product substitution requires additional materials or accessories for installation in the project, Contractor shall be responsible for all costs.

F. Finishes
   1. Proposed product substitution shall not decrease the selection of colors or finishes.

G. Storage and Handling
   1. Include within the Contractor's quality assurance program such procedures as are required to assure full protection of work and materials.

H. Warranty
   1. Warranty of product shall not be less than that of specified product.

3.03 PRODUCT SUBSTITUTION REQUEST FORM

A. The Architect’s “Substitution Request Form” must be used for each product submitted for consideration. The form is attached following this Section.

B. The Individual or Firm requesting a substitution must document that the requested substitution is equal or superior to the specified product. Failure to provide clear, accurate, and adequate documentation will be grounds for rejection. Any re-submittal will be handled as a new request.

C. Required documentation shall consist of applicable information which would aid the Architect in making an informed decision. Include side by side product comparisons, technical data, laboratory test results, product drawings, etc. References shall include three projects, which are from one to two years old, and three projects older than five years. Provide a list of references with the owners contact name and phone number.

D. If use of the proposed product would result in changes to the design of the building, the submittal shall describe fully the changes required to the drawings or project manual. Any cost differences resulting from modifications to the drawings and project manual and the cost of making the changes shall be borne by the Product Supplier.

E. Incomplete forms shall be rejected. The decision of the Architect is final.

3.04 OWNER-SUPPLIED PRODUCTS

A. Owner's Responsibilities:
   1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
   2. Arrange and pay for product delivery to site.
   3. On delivery, inspect products jointly with Contractor.
   4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
   5. Arrange for manufacturers' warranties, inspections, and service.

B. Contractor's Responsibilities:
   1. Review Owner reviewed shop drawings, product data, and samples.
   2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
   3. Handle, store, install and finish products.
   4. Repair or replace items damaged after receipt.
   5. Coordinate dimensions of Owner furnished materials and equipment with drawings and specifications prior to installation to ensure proper fit in conjunction with other Contractor supplied materials and equipment.

3.05 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged in manufacturer's original container with labels intact and legible.
   1. Maintain packaged materials with seals unbroken and labels intact until time of use.
   2. Promptly remove damaged material and unsuitable items from the job site, and promptly replace with material meeting the specified requirements, at no additional cost to the Owner.

G. The Architect may reject as non-complying such material and products that do not bear identification and satisfactory to the Architect as to manufacturer, grade, quality, and other pertinent information.

H. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

I. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.06 STORAGE AND PROTECTION

A. Provide protection of stored materials and products against theft, casualty, or deterioration.

B. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.

C. Store and protect products in accordance with manufacturers' instructions. Failure to comply will result in rejection of products for use on job.

D. Store with seals and labels intact and legible.

E. Arrange storage of materials and products to allow for visual inspection for the purpose of determination of quantities, amounts, and unit counts.

F. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.

G. For exterior storage of fabricated products, place on sloped supports above ground.

H. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.

I. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

J. Comply with manufacturer's warranty conditions, if any.

K. Do not store products directly on the ground.

L. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

M. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

N. Prevent contact with material that may cause corrosion, discoloration, or staining.

O. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

P. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

Q. In event of damage, promptly make replacements and repairs to the approval of the Architect and at no additional cost to the Owner.

R. Additional time required to secure replacements and to make repairs will not be considered by the Architect to justify an extension in the Contract Time of Completion.

END OF SECTION

MORE THAN ARCHITECTS

INSTRUCTIONS FOR USE OF SUBSTITUTION REQUEST FORM

STEPS

1. Substitution request **including all required documentation** must be emailed to the Project Leader at the Architects office no later than the date indicated in the specifications. Requests submitted late will not be considered. Contact information can be found on the Huckabee website bidding section under the specific project at: www.huckabee-inc.com/construction/

2. The Huckabee "Substitution Request Form" must be used for each project submitted for consideration.

3. The Individual or Firm requesting a substitution must document that the requested substitution is equal or superior to the specified product. Failure to provide clear, accurate, and adequate documentation will be grounds for rejection. Any re-submittal will be handled as a new request.

4. Required documentation shall consist of applicable information which would aid the Architect in making an informed decision. Include **side-by-side product comparisons**, technical data, laboratory test results, product drawings, etc. References shall include three projects which are from one to two years old, and three projects older than five years. Provide a list of references with the owner's contact name and telephone number.

5. If use of the proposed product would result in changes to the design of the building, the submittal shall describe fully the changes required to the drawings or specifications. Any cost differences resulting from modifications to the drawings and specifications and the cost of making the changes shall be borne by the Product Supplier.

6. **No** product will be considered "as equal" to the product specified until it has been included as an allowable substitution in a written Addendum to the project.

7. The decision of the Architect is final.

MORE THAN ARCHITECTS

SUBSTITUTION REQUEST FORM

Architect Project No:_____ Bid Date:_____ Date of Request:_____

Project Name: _____

SUBSTITUTION REQUEST BY:

Firm:_____

Address:_____

_____

Phone: _____

Fax: _____

We hereby request that the following Substitution be allowed in lieu of the Product specified on the above project.

ARCHITECT / ENGINEERS RESPONSE:

☐ APPROVED ☐ APPROVED AS NOTED

☐ NOT APPROVED ☐ SUBMITTED TOO LATE

☐ FAILED TO PROVIDE ADEQUATE INFORMATION

REMARKS:_____

_____

BY:_____DATE:_____

SPECIFIED PRODUCT_____ **SPECIFICATION SECTION** _____

PROPOSED PRODUCT SUBSTITUTION_____

This request includes the following: attached Technical Data, Laboratory Tests and proposed changes to the Drawings and Specifications, which the proposed Substitution will require for proper installation.

_____

_____

The Firm requesting the Substitution agrees to pay for changes to the building design, including Architectural, Engineering, and detailing costs caused by the requested Substitution. ☐ YES ☐ NO ☐ NOT APPLICABLE

What effect does the Substitution have on other trades? _____

_____

What effect does Substitution have on Construction Schedule? _____

_____

Differences between proposed Substitution and specified item? _____

_____

Manufacturer's guarantees of the proposed and specified items are: _____ Same _____ Different
(If different, explain on attachment)

The undersigned state that the function, appearance and quality are equivalent or superior to the specified item.

_____
SIGNATURE

_____ _____
TITLE DATE

Huckabee

SECTION 01 6210
SCHEDULE OF MATERIALS AND COLORS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Information and procedures for color submission for color schedule.

B. Schedule of Materials and Colors for pre-selected colors.

1.02 COLOR SCHEDULE PROCEDURES - PRE-BID SELECTED

A. Contractor shall hold color samples requiring color selections until all are received. Only then shall the actual color samples be submitted to the Architect for selection. Colors samples matching color schedule shall not be submitted until field sample verifications are required.
   1. Contractor shall submit a complete transmittal letter with each related group of items. Each sample shall be properly labeled with the name of the project, contractor, manufacturer, and date of submission. Incomplete color submittals will be returned to the Contractor.
   2. The Contractor shall allow two (2) weeks after all colors are submitted for final Owner approval.

1.03 COLOR SCHEDULE PROCEDURES - POST-BID SELECTED

A. Contractor shall hold all color samples until all items requiring color selections are received. Only then shall the actual color samples be submitted to the Architect for selection.
   1. Colors are noted on the drawings, and as specified. Where colors are not specified, Architect will select color with final color schedule.
   2. Contractor shall submit a complete transmittal letter with each related group of items. Each sample shall be properly labeled with the name of the project, contractor, manufacturer, and date of submission. Incomplete color submittals will be returned to the Contractor.
   3. The Contractor shall allow five (5) weeks after all colors are submitted for final Owner approval.

1.04 COLORS AND PATTERNS

A. Unless the precise color and pattern is specifically called out in the Contract Documents, and whenever a choice of color or pattern is available in the specified products, submit accurate color and pattern charts to the Architect for selection.

B. Verify all graphics with the Architect before proceeding. Graphics may need to be adjusted to reflect the same composition as that shown on the drawings.

1.05 SUBMITTALS

A. Field Samples
   1. Once colors are selected, and received at the job site and prior to application or installation, the Contractor shall submit one (1) sample of each item to the Architect for verification of color and pattern.
   2. The Contractor shall allow five (5) working days from date of receipt of submission for verification notification.

1.06 SCHEDULING

A. Contractor shall submit all products in a timely manner to avoid project delays for long lead time items.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers listed or named in a product or system specification are those manufacturers considered capable of manufacturing products conforming to the specification requirements.

B. The “listing” or “naming” of a manufacturer does not imply “acceptance” or “approval” of any standard product of that manufacturer.

C. Products listed or named manufacturers proposed for use shall be comparable in all respects to specified make or model number designation of named products and shall meet or exceed specification requirements of type, function, color, and quality.

D. Where products are specified by naming model number and manufacturers only, the named products establish a standard of quality. Refer to individual specification sections for additional manufacturers and procedures.

2.02 MATERIALS - GENERAL

A. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:
   1. Provide selections made by Architect from manufacturer's full range of standard colors, textures, and patterns for products of type indicated.
   2. Provide trim and accessories that match color and finish unless noted otherwise.
   3. Where contractor is submitting a substitution, contractor shall provide color equal to that specified. Substituted colors are not considered approved unless published in writing in Addendum prior to bid. If substituted product does not match specified color, contractor shall provide custom color as required at no additional cost to the owner.

PART 3 - EXECUTION

3.01 APPLICATION

A. Paint any vents, grilles, piping, columns, etc. the same color as the wall or graphic unless noted otherwise.

B. Unless otherwise noted, all accent paint shall terminate at an inside corner. If wall terminates at storefront, wrap paint to meet edge of storefront.

C. All exposed concrete shall be sealed.

3.02 SCHEDULE OF MATERIALS AND COLORS

A. General Notes:
   1. All paint colors are subject to last shade adjustments.
   2. The Contractor shall submit samples of all finishes for comparison and approval of colors to the items listed in the color schedule.
   3. Where multiple buildings occur in one project, all materials and finishes may not apply to all buildings. Refer to the drawings for material and finish locations.
   4. The General Contractor shall verify all colors selections and numbers and note any drawings changes that may have occurred. Notify the Architect of any discrepancies found within 14 days.
   5. Notes stating "See Drawings for Locations" refer to the Construction Documents.
   6. Where note “pending submittal” occurs, Contractor shall submit samples of the material that meets the Standards outlined in the appropriate specification for Architect’s review and selection. For materials with more than one color, texture or pattern available, Contractor shall submit the Manufacturer’s full range of colors, texture and patterns.
   7. If there is a conflict between the product, material or color specified in this Legend and the product's specification Section within the Division, notify the Architect immediately. The Schedule of Materials and Colors shall govern unless a written clarification is given.

B. See DRAWINGS for Schedule of Materials and Colors for specific product details and requirements.

END OF SECTION

SECTION 01 7000
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Requirements for alterations work, including selective demolition, except removal, disposal, and/or remediation of hazardous materials and toxic substances.

C. Pre-installation meetings.

D. Cutting and patching.

E. Surveying for laying out the work.

F. Cleaning and protection.

G. Starting of systems and equipment.

H. Demonstration and instruction of Owner personnel.

I. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

J. General requirements for maintenance service.

K. Administration of Warranty Phase.

1.02 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.

B. Section 01 3000 - Administrative Requirements: Submittals procedures, Electronic document submittal service.

C. Section 01 4000 - Quality Requirements: Testing and inspection procedures.

D. Section 01 5000 - Temporary Facilities and Controls: Temporary exterior enclosures.

E. Section 01 7900 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections

F. Individual Product Specification Sections:
   1. Advance notification to other sections of openings required in work of those sections.
   2. Limitations on cutting structural and load bearing members.

1.03 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
   1. On request, submit documentation verifying accuracy of survey work.
   2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in compliance with Contract Documents.
   3. Submit surveys and survey logs for the project record.

C. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
   1. Structural integrity of any element of Project.
   2. Integrity of weather exposed or moisture resistant element.

3. Efficiency, maintenance, or safety of any operational element.
4. Visual qualities of sight exposed elements.
5. Work of Owner or separate Contractor.
6. Include in request:
    a. Identification of Project.
    b. Location and description of affected work.
    c. Necessity for cutting or alteration.
    d. Description of proposed work and products to be used.
    e. Effect on work of Owner
    f. Date and time work will be executed.

1.05 QUALIFICATIONS

A. For demolition work, employ a firm specializing in the type of work required.
    1. Minimum of 5 years of documented experience.

B. For surveying work, employ a land surveyor registered in Texas and acceptable to Architect. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,

C. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in Texas. Employ only individual(s) trained and experienced in establishing and maintaining horizontal and vertical control points necessary for laying out construction work on project of similar size, scope and/or complexity.

D. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in Texas.

1.06 PROJECT CONDITIONS

A. Use of explosives is not permitted.

B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

C. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

D. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

E. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
    1. Provide dust-proof enclosures to prevent entry of dust generated outdoors.
    2. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.

F. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
    1. Minimize amount of bare soil exposed at one time.
    2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
    3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
    4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

G. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
    1. Outdoors: Limit conduct of especially noisy exterior work to the hours of 8 am to 5 pm.

2. Indoors: Limit conduct of especially noisy interior work to 8 am to 5 pm.

H. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.
1. Pest Control Service: Monthly treatments.

I. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

J. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.07 COORDINATION

A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Notify affected utility companies and comply with their requirements.

C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

F. Coordinate completion and clean-up of work of separate sections.

G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

G. Prior to start of work, photo and/or video document all portions of the building.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

A. When required in individual specification sections, Contractor will convene a preinstallation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section. Contractor, subcontractor, and manufacturer's representative shall be present.

C. Notify Architect seven (7) days in advance of meeting date.

D. Prepare agenda and preside at meeting:
   1. Review approved submittals.
   2. Review conditions of examination, preparation and installation procedures.
   3. Review coordination with related work.
   4. Installation schedule.

E. Record minutes and distribute copies within two days after meeting to participants, with one copies to Architect, Owner, participants, and those affected by decisions made.

F. Pre-installation meeting shall not be scheduled until approved submittals are verified by the Contractor.

3.04 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect of any discrepancies discovered.

C. Contractor shall locate and protect survey control and reference points.

D. Control datum for survey is that indicated on drawings.

E. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

F. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

G. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.

H. Utilize recognized engineering survey practices.

I. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
   2. Grid or axis for structures.
   3. Building foundation, column locations, ground floor elevations.

J. Periodically verify layouts by same means.

K. Maintain a complete and accurate log of control and survey work as it progresses.

3.05 GENERAL INSTALLATION REQUIREMENTS

A. In addition to compliance with regulatory requirements, conduct construction operations in compliance with NFPA 241, including applicable recommendations in Appendix A.

B. Contractor shall ensure all bid and proposal documents and contracts include, if applicable to their trade, all required information related to trench excavation and working safety in compliance with Texas Health and Safety Code 756.021.

C. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

D. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

E. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

F. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

G. Make neat transitions between different surfaces, maintaining texture and appearance.

3.06 NOTIFICATION OF ARCHITECT

A. The Contractor shall notify the Architect a minimum of 48 hours prior to the covering up of any work in progress, in order for the architect to make proper field observations of the work in place. The Contractor shall place NO concrete, fill-in ditches, or cover up walls or ceilings without first contacting the Architect, as noted above and receiving approval.

3.07 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 indicated.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of alterations work constitutes acceptance of existing conditions.

B. Keep areas in which alterations are being conducted separated from other areas that are still occupied.
   1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 5000 in locations indicated on drawings.
   2. Provide sound retardant partitions of construction indicated on drawings in locations indicated on drawings.

C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
   1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
   2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.

D. Remove existing work as indicated and as required to accomplish new work.
   1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
   2. Remove items indicated on drawings.
   3. Relocate items indicated on drawings.
   4. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.

5. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.

E. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, Telecommunication, and Technology): Remove, relocate, and extend existing systems to accommodate new construction.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
   2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
   3. 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.
      a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
      b. Provide temporary connections as required to maintain existing systems in service.
   4. Verify that abandoned services serve only abandoned facilities.
   5. Remove abandoned pipe, ducts, conduits, and equipment including those above acoustical lay-in ceilings and gypsum board/hard ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.

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.

G. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
   1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect.
   2. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
   3. Where a change of plane of 1/4 inch or more occurs in existing work, submit recommendation for providing a smooth transition for Architect review and request instructions.

H. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.

I. Refinish existing surfaces as indicated:
   1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
   2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.

J. Clean existing systems and equipment.

K. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.

L. Do not begin new construction in alterations areas before demolition is complete.

M. Comply with all other applicable requirements of this section.

3.08 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. See Alterations article above for additional requirements.

C. Perform whatever cutting and patching is necessary to:
   1. Complete the work.
   2. Fit products together to integrate with other work.
   3. Provide openings for penetration of mechanical, electrical, and other services.
   4. Match work that has been cut to adjacent work.
   5. Repair areas adjacent to cuts to required condition.
   6. Repair new work damaged by subsequent work.
   7. Remove samples of installed work for testing when requested.
   8. Remove and replace defective and non-complying work.

D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

E. Employ skilled and experienced installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

G. Restore work with new products in accordance with requirements of Contract Documents.

H. Fit work air tight at interior and weathertight at exterior to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 8400, to full thickness of the penetrated element.

J. Patching:
   1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
   2. Match color, texture, and appearance.
   3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.09 PROGRESS CLEANING

A. General:
   1. Retain stored items in an orderly arrangement allowing maximum access, not impeding traffic or drainage, and providing required protection of materials.
   2. Do not allow accumulation of scrap, debris, waste material, and other items not required for construction of this Work.
   3. At least twice each month, and more often if necessary, completely remove all scrap, debris, and waste material from the job site.
   4. Provide adequate storage for all items awaiting removal from the job site, observing requirements for fire protection and protection of the ecology.

B. Site:
   1. Daily, and more often if necessary, inspect the site and pick up all scrap, debris, and waste material. Remove such items to the place designated for their storage.

2. Weekly, and more often if necessary, inspect all arrangements of materials stored on the site. Restack, tidy, or otherwise service arrangements to meet the requirements of subparagraph A.1 above.
3. Maintain the site in a neat and orderly condition at all times.

C. Structures:
1. Weekly, and more often if necessary, inspect the structures and pick up all scrap, debris, and waste material. Remove such items to the place designated for their storage.
2. Weekly, and more often if necessary, sweep interior spaces clean.
a. "Clean", for the purpose of this subparagraph, shall be interpreted as meaning free from dust and other material capable of being removed by use of reasonable effort and a hand-held broom.
3. As required preparatory to installation of succeeding materials, clean the structures or pertinent portions thereof to the degree of cleanliness recommended by the manufacturer of the succeeding material, using equipment and materials required to achieve the necessary cleanliness.
4. Following the installation of finish floor materials, clean the finish floor daily (and more often if necessary) at all times while work is being performed in the space in which finish materials are installed. Damaged floors will be removed and replaced.
a. "Clean", for the purpose of this subparagraph, shall be interpreted as meaning free from foreign material which, in the opinion of the Architect, may be injurious to the finish floor material.

3.10 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

G. Prohibit traffic from landscaped areas.

H. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.11 SYSTEM STARTUP

A. Coordinate with General Commissioning Requirements per Mechanical Specifications.

B. Coordinate schedule for start-up of various equipment and systems.

C. Notify Architectand Owner 14 days prior to start-up of each item.

D. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

E. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

F. Verify that wiring and support components for equipment are complete and tested.

G. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.

H. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

I. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.12 DEMONSTRATION AND INSTRUCTION

A. See Section 01 7900 - Demonstration and Training.

B. Refer to individual specification sections for more specific demonstration and training requirements.

3.13 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

B. Testing, adjusting, and balancing HVAC systems: See Division 23 for specific requirements.

3.14 FINAL CLEANING

A. "Clean", for the purpose of this Article, and except as may be specifically provided otherwise, shall be interpreted as meaning the level of cleanliness generally provided by skilled cleaners using commercial quality building maintenance equipment and materials.

B. The Contractor shall have initial cleaning complete prior to the Architect performing the “Punch List” walkthrough. The building shall be thoroughly (ready for occupancy) cleaned prior to the Owner acceptance (Substantial Completion) of the building.

C. Prior to completion of the Work, remove from the job site all tools, surplus materials, equipment, scrap, debris, and waste. Conduct final progress cleaning as described in the Article above.

D. Site:
   1. Unless otherwise specifically directed by the Architect, broom clean paved areas on the site and public paved areas adjacent to the site. Powerwash paved surfaces, as required, to remove any stains caused by construction materials, vehicles, or workers, as approved by the Architect, and at no additional cost to the Owner.
   2. Completely remove resultant debris.

E. Structures:
   1. Exterior:
      a. Visually inspect exterior surfaces and remove all traces of soil, waste materials, smudges, and other foreign matter.
      b. Remove all traces of splashed materials from adjacent surfaces.
      c. If necessary to achieve a uniform degree of cleanliness, hose down the exterior of the structure.
      d. In the event of stubborn stains not removable with water, the Architect may require light sandblasting or other cleaning at no additional cost to the Owner.
   2. Interior:
      a. Visually inspect all interior surfaces (floors, walls, ceilings, fixtures, furniture, appliances, and equipment) and remove all traces of soil, waste materials, smudges, and other foreign matter.
      b. Remove all traces of splashed material from adjacent surfaces.
      c. Remove paint droppings, spots, stains, and dirt from finished surfaces.
   3. Glass: Clean inside and outside.
   4. Polished surfaces: To surfaces requiring routine application of buffed polish, apply the polish recommended by the manufacturer of the material being polished.

F. Schedule final cleaning as approved by the Architect to enable the Owner to accept a completely clean Work.

3.15 CLEANING DURING OWNER'S OCCUPANCY

A. Should the Owner occupy the Work or any portion thereof prior to its completion by the Contractor and acceptance by the Owner, responsibilities for interim and final cleaning shall be as determined by the Architect in accordance with the General Conditions of the Contract.

3.16 CLOSEOUT PROCEDURES

A. Project Closeout
   1. No later than 60 days prior to Project Completion, as scheduled on the Contractors Critical Path Schedule, the Contractor shall:
      a. Develop a Project Completion List for any and all tasks that remain along with a schedule for the completion of each. This list and schedule shall be written and delivered to the Owner and Architect.
      b. Provide “hands-on” training to the Owner of all major systems as identified in Section 01 7800 – Closeout Submittals

B. Substantial Completion
   1. Prior to requesting inspection by the Architect, use adequate means to assure that the Work is completed in accordance with the specified requirements and is ready for the requested inspection.
   2. No later than 30 days prior to the scheduled Substantial Completion date the Contractor shall call for a project walk through to determine if the project is substantially complete.
      a. The Contractor shall prepare and submit a list of deficiency items as required by Paragraph 9.8.2 of the General Conditions. This list shall be submitted to the Architect a minimum of 7 days prior to the scheduled walk through.
      b. The Contractor shall provide copies of the complete TAB (Commissioning) report and verification that all repairs have been made and that the systems are operational. This report and verification shall be submitted to the Architect a minimum of 7 days prior to the scheduled walk through.
      c. The Contractor shall obtain the Certificate of Occupancy from the AHJ and supply a copy to the Architect a minimum of 7 days prior to the scheduled walk through and before substantial completion will be issued.
      d. On the scheduled date of the walk through and after receipt of the deficiency list (punch list) the Architect will inspect the project to determine the status of completion.
      e. Following inspection of the work, the Architect determines that the work is not substantially complete:
         1) The Architect promptly will so notify the Contractor, in writing, giving the reasons therefore.
         2) The Contractor shall remedy the deficiencies and notify the Architect when ready for re-inspection. The Architect will make only one trip to re-inspect the project.
         3) The Architect shall be entitled to reimbursement of costs on an hourly basis for time spent to re-inspect the project. Rate for reimbursement shall be two hundred dollars per hour ($200.00/hr) including travel time and shall be charged against the Contractors retainage held for this work.
   3. When the Architect concurs that the Work is substantially complete:
      a. The Architect will prepare a "Certificate of Substantial Completion" on AIA Form G704, accompanied by the Contractor's list of items to be completed or corrected, as verified by the Architect.
      b. The Architect will submit the Certificate to the Owner and to the Contractor for their written acceptance of the responsibilities assigned to them in the Certificate.

C. Final Completion
   1. Prepare and submit the notice required by the first sentence of Paragraph 9.10.1 of the General Conditions.

2. Verify that the Work is complete including, but not necessarily limited to, the items mentioned in Paragraph 9.8.2 of the General Conditions.
3. Certify that:
   a. Contract Documents have been reviewed;
   b. Work has been inspected for compliance with the Contract Documents;
   c. Work has been completed in accordance with the Contract Documents;
   d. Equipment and systems have been tested as required, and are operational;
   e. Work is completed and ready for final inspection.
4. The Architect will make an inspection to verify status of completion.
5. Should the Architect determine that the Work is incomplete or defective:
   a. The Architect promptly will so notify the Contractor, in writing, listing the incomplete or defective work.
   b. Remedy the deficiencies promptly, and notify the Architect when ready for re-inspection.
6. When the Architect determines that the Work is acceptable under the Contract Documents, he will request the Contractor to make closeout submittals.

D. Closeout Submittals
1. Closeout submittals as described in Section 01 7800 and Architect approval secured.
2. Refer attached Check List.
3. Contractor shall deliver all attic stock referenced in specifications. Attic stock shall be delivered to owners designated location. Contractor shall obtain a signed receipt of delivery.
4. Contractor shall obtain Certificate of Occupancy from the AHJ and submit a copy to the Architect.

E. Release of Funds
1. Retainage for the project will be held until project closeout is complete as verified by the items in paragraph above and the attached Check List including the completion of all Punch List items.
2. The Architect will estimate the cost of each item on the Punch List, withholding funds for each which shall be separate from the retainage. These funds will be released to the Contractor as items are completed and verified on the Punch List.
3. THE RETAINAGE WILL NOT BE RELEASED UNTIL CERTIFICATE OF OCCUPANCY FROM THE AHJ HAS BEEN SUBMITTED TO THE ARCHITECT.
4. THE RETAINAGE WILL NOT BE RELEASED UNTIL THE PROJECT CLOSEOUT IS COMPLETE.

F. Final adjustment of accounts
1. Submit a final statement of accounting to the Architect, showing all adjustments to the Contract Sum.
2. If so required, the Architect will prepare a final Change Order showing adjustments to the Contract Sum which were not made previously by Change Orders.

FINAL ACCEPTANCE CHECKLIST

DATE:_____

PROJECT NAME:_____

OWNER'S NAME:_____

COMPLETED BY:_____

TO:_____

COPY TO:_____

THE FOLLOWING CHECKLIST IS COMPLETED AND THEREFORE THE PROJECT IS READY FOR FINAL PAYMENT AS OUTLINED IN THE CONTRACT DOCUMENTS.

Received Final Payment Request and Release of Claims.			
Final Change Order Completed and Signed By All.			
Contractor's Affidavit of Payment of Debts and Claims.			
Consent of Surety To Final Payment.			
All Operation & Maintenance Manuals Received.			
Final Record Drawings Received.			
All Guarantees and Warranties Received.			
Punchlist Fully Cleared (Attached Copy).			
Air Quality and Commissioning Completed and All Items Addressed and Corrected.			
Written Acknowledgement of Lead and Asbestos Free.			
All Attic Stock Delivered to Owner.			
Certificate of Occupancy Obtained From AHJ			

EXPLANATION OF ANY OUTSTANDING ISSUES OR DEFICIENCIES:_____

_____

_____

HEREBY SUBMITTED FOR REVIEW:

SIGNED:_____ **DATE:**_____

3.17 MAINTENANCE

A. Provide service and maintenance of components indicated in specification sections.

B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.

1. Review warranty request procedures with the Architect and Owner no less than two weeks prior to Date of Substantial Completion.
2. All work performed and completed during the Contractor's one year warranty period shall be noted as complete and signed off on accordingly on a warranty request form as agreed upon by Owner and Architect. The form will be provided to the Contractor for each item requested for maintenance or repair and is required to be returned, once the work is complete, in the same originally sent document format with cause and corrective action described in detail. All work during the Contractor's one year warranty period shall be communicated by the Contractor to both the Owner and Architect.
3. 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. Contractor agrees to provide notice of the warranty expiration date to Owner and Architect at least one month prior to the expiration of the one year warranty period on each building or each phase of the building, which has been substantially completed. Prior to termination of the one year warranty period, Contractor shall accompany the Owner and Architect on review of the building and be responsible for correcting any reasonable deficiencies not caused by the Owner or by the use of the building which are observed or reported during the review. 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 three (3) 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.

C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION

SECTION 01 7800
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedures for digital project records.

B. Project Record Documents.

C. Operation and Maintenance Data.

D. Closeout Documents.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

B. Section 01 7000 - Execution and Closeout Requirements: Contract closeout procedures.

C. Section 01 7900 - Demonstration and Training: Training requirements.

D. Individual Product Sections: Specific requirements for operation and maintenance data.

E. Individual Product Sections: Warranties required for specific products or Work.

F. Individual Product Sections: Specific requirements for demonstration and training.

1.03 SUBMITTALS

A. Submittal Procedure

1. Within sixty (60) days following the Notice to Proceed, the Contractor shall submit a list of Expected Closeout Documents for review by the Architect. This list shall include project record documents, operation and maintenance data, warranties, bonds, contract forms, health/safe environment data, attic stock sign offs, Owner training, certifications and inspections, and other types as indicated. All items on the list shall be titled with spec section number and general description - Example: "09 3000 Tiling - 1 year warranty".
2. The Architect will review the list of Expected Closeout Documents, provide revision comments and return it to the Contractor within fourteen (14) business days. If revisions are required, the Contractor shall then resubmit a revised list to the Architect and Owner within fourteen (14) business days and thereafter until approved.
3. Contractor may submit Closeout Documents by Specification Division in full as scopes of work are completed.
4. Within sixty (60) calendar days of substantial completion, Contractor shall submit closeout submittals as required in accordance with this section and secure Architect’s approval.
5. Contractor shall provide cover page with space for Contractor and Architect review stamps for each submission.
6. The Architect's approval of the current status of Project Record Documents may be a prerequisite to the Architect's approval of requests for progress payment and request for final payment under the Contract.
7. Prior to submitting each request for progress payment, secure the Architect's approval of the current status of the Project Record Documents.
8. Prior to submitting request for final payment, Contractor shall submit the final Project Record Documents to the Architect and secure approval.
9. Contractor shall submit a complete set of closeout documents for each project where multiple projects are combined under a single proposal package.
10. Review and Final Submission of Closeout Submittals
    a. Participate in review meetings as required.
    b. Documents shall be reviewed and verified by contractor prior to submission to the Architect.

c. Review submittal with Owner and Architect prior to final submittal for review and electronic archiving.
d. Number shall be Architects project number followed by the appropriate specification section - consecutive submittal number for section.
(Example - 1234-01-01 Tiling 09 3000 - 5)
When material is re-submitted for any reason, transmit under a new letter of transmittal and with a new transmittal number. On re-submittals, cite the original submittal number for reference.
e. Contractor shall allow 14 days from date of submission for Preliminary Architectural Review excluding delivery time to and from the Contractor.
f. The contractor shall be responsible for delays caused by rejection of inadequate or incorrect submittals.
g. Submittals received by Architect without General Contractor's stamp will be rejected.
h. Make changes required from the Preliminary Architectural Review and deliver the Final Project Record Documents to and secure approval from the Architect. When revised for resubmission, identify all changes made since previous submission.
i. Contractor will pay all associated cost in preparing close-out documents.

11. Closeout Submittals Requirements.
a. Closeout and Record Documents as required by this section shall be provided to the Owner upon completion of the project. Submit the number as outlined below:
1) Project Record Documents - Drawings and Project Manual
(a) One (1) copy on USB Flash Drive
2) Closeout Documents – Including Operation and Maintenance Manuals
(a) One (1) copy on USB Flash Drive
b. Electronic Submittal Format.
1) The digital file shall be set up using a non-proprietary “PDF” format.
2) All data shall be indexed/book marked and hyperlinked to associated data.
3) Data shall be searchable by key word. All data shall allow printing of material.
4) Electronic submittal shall follow the format shown in Part 3.
5) Under paragraph 3.05 Assembly of Operations and Maintenance Manuals, all items shall be organized as specified.
c. Training Session Submittal Format.
1) Refer to Section 01 7900 - Demonstration and Training.

B. Project Record Documents: Submit documents to and secure approval from Architect prior to request for final Application for Payment.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. All record documents shall be maintained on site in digital format; record actual revisions to the Work, including but no limited to:
1. Drawings.
2. Specifications.
3. Addenda.
4. RFIs.
5. Change Orders and other modifications to the Contract.
6. Reviewed shop drawings, product data, and samples.
7. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Contractor shall maintain and protect the record documents with backups and/or any other means necessary to ensure the integrity of the digital files.

D. In the event of loss of recorded data, use means necessary to again secure the data to the Architect's approval.
   1. Such means shall include, if necessary in the opinion of the Architect, removal and replacement of concealing materials.
   2. In such case, provide replacements to the standards originally required by the Contract Documents.

E. Record information concurrent with construction progress. Record Documents shall be current and submitted with each pay application.

F. Specifications: Record at each product section description of actual products installed, including the following:
   1. Manufacturer's name and product model and number.
   2. Product substitutions or alternates utilized.
   3. Changes made by Addenda and modifications.

G. Record Drawings and Shop Drawings: Mark each item to record actual construction including:
   1. On the cover sheet of the Project Manual and the Drawings, provide the following statement, “RECORD DOCUMENTS- The changes noted herein are indicated in color and are designated by a revision delta (RD). The changes are recorded by [Contractor Name], [Date].”
   2. Prior to construction, insert all addenda to the record documents, both drawings and specifications as modified.
   3. Making entries on Drawings.
      a. Using colored markings, clearly describe the change by graphic line and note as required.
      b. Date all entries.
      c. Call attention to the entry by a "cloud" drawn around the area or areas affected. Add delta triangle with the letters “RD” inside the triangle.
      d. In the event of overlapping changes, use different colors for the overlapping changes.
   4. In addition to field changes, mark the record documents with areas modified by RFIs and change orders and hyperlink to the corresponding data.
   5. Schematic layouts.
      a. In some cases on the Drawings, arrangements of conduits, circuits, piping, ducts, and similar items, are shown schematically and is not intended to portray precise physical layout.
      b. Clearly identify the item by accurate note such as "cast iron drain," "copper water", and the like.
         1) Show, by symbol or note, the vertical location of the item ("under slab", "in ceiling plenum," "exposed," and the like).
         2) Make all identification sufficiently descriptive that it may be related reliably to the Specifications.
   6. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
   7. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
   8. Field changes of dimension and detail.
   9. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:
   1. Product data, with catalog number, size, composition, and color and texture designations.
   2. Information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.

D. Additional information as specified in individual product specification sections.

E. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. Refer to Divisions 21, 22, 23, 26, 27 and 28 for system requirements.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Assemble operation and maintenance data into organized file folders for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

B. Where systems involve more than one specification section, provide separate folder for each system.

C. Cover: Identify each USB Flash Drive with the title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

D. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants,Contractor and subcontractors, with names of responsible parties organized by division with project scopes listed for each company.

E. Tables of Contents: List every item using the same identification as on the content section and hyperlinked accordingly; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.

F. Contents: Prepare final project record closeout documents for delivery to Owner in PDF file format as follows:
   1. FILE FOLDER: XXXX-XX OWNER'S NAME - PROJECT NAME - CLOSEOUT SUBMITTAL
      a. FILE FOLDER: 01 Table of Contents
         1) PDF File: Table of Contents
      b. FILE FOLDER: 02 Project Directory
         1) PDF File: Project Directory (organized as below):
            (a) Design Team
            (b) General Contractor
            (c) Sub-Contractors and Principal Vendors (organized by Division with project scope(s) listed for each Company)
      c. FILE FOLDER: 03 Contract Forms (organized and titled as below):

1) PDF FILE: Substantial Completion, AIA G704
2) PDF FILE: Payment and Performance Bond
3) PDF FILE: Certificates of Liability Insurance
4) PDF FILE: Contractor's Affidavit of Payment of Debts and Claims, AIA G706
5) PDF FILE: Contractor's Affidavit of Release of Liens, AIA G706A
6) PDF FILE: Consent of Surety to Final Payment, AIA G707
7) PDF FILE: Contractor and Sub-contractors' Release or Waiver of Liens
8) FILE FOLDER: Change Orders
   (a) PDF FILES: (separate files for each Change Order, organized and titled in numerical order)

d. FILE FOLDER: 04 Certifications and Inspections (organized and titled as below):
1) PDF FILE: The correspondence from the Geotechnical Engineer, required by Section 01 1400 at the beginning of construction, indicating that the Construction Documents conform with their recommendations.
2) PDF FILE: The correspondence from the Special Inspection and Testing Agency (SITA), required by Section 01 1400 at the beginning of construction, indicating that the SITA accepted the responsibility to perform the specified SITA scope and meet the specified SITA qualifications
3) PDF FILE: The correspondence from the Commissioning Agent (CxA), required by Section 01 1400 at the beginning of construction, indicating that the CxA accepted the responsibility to perform the specified SITA scope and meet the specified SITA qualifications
4) PDF FILE: The "Acknowledgement of Contractor's Responsibilities Related to Code-Required Quality Control" required by Section 01 4533 at the beginning of construction.
5) PDF FILE: A copy of the written correspondence from the Contractor to the AHJ submitting the "Final Reports of Quality Control" required by Section 01 4533 from the SITA, CxA, and Code-Required Structural Observer. The copy of this correspondence shall include the actual reports and not just be a cover letter.
6) PDF FILE: The "Final Report of Quality Control" required by Section 01 4533 from the SITA
7) PDF FILE: The "Final Report of Quality Control" required by Section 01 4533 from the CxA
8) PDF FILE: The "Final Report of Quality Control" required by Section 01 4533 from the Code-Required Structural Observer
9) PDF FILE: The "Final Report of Quality Control" required by Section 01 4533 from the Structural Engineer
10) PDF FILE: The "Final Report of Quality Control" required by Section 01 4533 from the Mechanical Engineer
11) PDF FILE: The "Final Report of Quality Control" required by Section 01 4533 from the Electrical Engineer
12) PDF FILE: Certificates of Occupancy
13) PDF FILE: TEA Certificate of Project Compliance. File may be downloaded at https://tea.texas.gov/sites/default/files/cert_pre2004.pdf. Sample form is attached following this Section.
14) PDF FILE: Final Fire Inspection
15) PDF FILE: Final Health Inspection
16) PDF FILE: Final Elevator Inspection
17) PDF FILE: Final Building Inspection
18) PDF FILE: Accessibility Review Report
19) PDF FILE: Energy Code Compliance Letter
20) PDF FILE: HVAC Test and Balance Reports

21) PDF FILE: Backflow Test Report
22) PDF FILE: Data Testing Results
23) FLW FILE: Data Testing Results (Native)

e. FILE FOLDER: 05 Health/Safe Environment Data (organized and titled as below):
1) PDF FILE: Asbestos-, Lead- and Hazardous-Free Material Certificates or Letter
2) PDF FILE: Material Safety Data Sheets (MSDS) (organized by Division)
3) PDF FILE: Indoor Air Quality Test Reports

f. FILE FOLDER: 06 Additional Project Information
1) FILE FOLDER: Requests for Information
(a) PDF FILES (separate files for each RFI, organized and titled in numerical order)
2) FILE FOLDER: Requests for Proposals
(a) PDF FILES (separate files for each RFP, organized and titled in numerical order)
3) FILE FOLDER: Approved Submittals
(a) PDF FILES (separate files for each Submittal, organized and titled in numerical order by specification section)

g. FILE FOLDER: 07 Attic Stock
1) PDF FILES: Attic Stock Sign-Off Sheets (separate files for each, showing Owner receipt, and organized and titled in numerical order by Specification Section)

h. FILE FOLDER: 08 Demonstration and Training
1) FILE FOLDER: Sign-In Sheets
(a) PDF FILES: (separate files for each, organized and titled in numerical order by Specification Section)
2) FILE FOLDER: Training Videos
(a) All training videos organized and titled in numerical order by Specification Section

i. FILE FOLDER: 09 Project Record Documents
1) PDF FILE: Project Record Specifications Manual (organized and bookmarked by Division and by Specification Section) - include and hyperlink all Addenda, RFIs, RFPs, and In-Field Changes stamped as "As-Built" or "Record Documents".
2) PDF FILE: Project Record As-Built Drawings (organized and bookmarked by Sheet Number) - include and hyperlink all Addenda, RFIs, RFPs, and In-Field Changes stamped as "As-Built" or "Record Documents".

j. FILE FOLDER: 10 Warranties
1) FILE FOLDERS: (separate file folders, organized and titled by Division)
(a) PDF FILES: (all warranty PDF files organized under each Division file folder and titled by Company Name)
(b) PDF FILE: List of all warranties extending past one year. Include company name and contact information.

k. FILE FOLDER: 11 Operation and Maintenance Manuals
1) PDF FILE: Keying Schedule
2) PDF FILE: Shop Drawings (separate files for each, organized and titled by Specification Section)
3) FILE FOLDER: Manuals
(a) FILE FOLDERS: (separate file folders, organized and titled by Division)
(b) PDF FILES: (all Manuals PDF files organized under each Division file folder and titled by Specification Section and scope)

3.06 CHANGES SUBSEQUENT TO ACCEPTANCE

A. The Contractor has no responsibility for recording changes in the Work subsequent to Final Completion, except for changes resulting from work performed under Warranty.

3.07 CERTIFICATION OF PROJECT COMPLIANCE

CERTIFICATION OF PROJECT COMPLIANCE	Completion of this form is required under provisions of 61.1036(c)(3)(F) TAC for all public school district construction projects.

1. PROJECT INFORMATION DISTRICT:

Facility: ARCHITECT/ENGINEER:

Address: CONTRACTOR/CM:

City: CONTRACT DATE:

DATE DISTRICT AUTHORIZED PROJECT:

BRIEF DESCRIPTION OF PROJECT:

2. CERTIFICATION OF DESIGN AND CONSTRUCTION

The intent of this document is to assure that the school district has provided to the architect/engineer the required information and the architect/engineer has reviewed the School Facilities Standards as required by the State of Texas, and used his/her reasonable professional judgment and care in the architectural/engineering design and that the contractor has constructed the project in a quality manner in general conformance with the design requirements and that the school district certifies to project completion. .

3. The District certifies that the educational program and educational specifications of this facility along with the identified building code to be used have been provided to the architect/engineer.

DISTRICT: **BY:** **DATE:**

4. The Architect/Engineer certifies the above information was received from the school district, and that the building(s) were designed in accordance with the applicable building codes. Further, the facility has been designed to meet or exceed the design criteria relating to space (minimum square footage), educational adequacy, and construction quality as contained in the School Facilities Standards as adopted by the Commissioner of Education, July 9, 2003, and as provided by the district.

ARCHITECT/ENGINEER: **BY:** **DATE:**

5. The Contractor certifies that this project has been constructed in general conformance with the construction documents as prepared by the architect/engineer listed above.

CONTRACTOR/CM: **BY:** **DATE:**

6. The District certifies completion of the project (as defined by the architect/engineer and contractor).

DISTRICT: **BY:** **DATE:**

SECTION 01 7900
DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 SUMMARY

A. Demonstration of products and systems to be commissioned and requiring routine maintenance where indicated in specific specification sections.

B. Training of Owner personnel in operation and maintenance is required for:
   1. All software-operated systems.
   2. HVAC systems and equipment.
   3. Plumbing equipment.
   4. Electrical systems and equipment.
   5. Conveying systems.
   6. Landscape irrigation.
   7. Audio and Visual systems.
   8. Lighting systems.
   9. Security systems and Access Controls.
   10. Fire Alarm systems.
   11. Kitchen Equipment.
   12. Resinous Flooring
   13. Items specified in individual product Sections.

C. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
   1. Roofing, waterproofing, and other weather-exposed or moisture protection products.
   2. Finishes, including flooring, wall finishes, ceiling finishes.
   3. Fixtures and fittings.
   4. Items specified in individual product Sections.

1.02 RELATED REQUIREMENTS

A. Section 01 7800 - Closeout Submittals: Operation and maintenance manuals.

B. Other Specification Sections: Additional requirements for demonstration and training.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures; except:
   1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Architect and Tomball ISD.
   2. Submittals indicated as "Draft" are intended for the use of Owner in preparation of overall Training Plan; submit in editable electronic format, latest version of Microsoft Word required.

B. Draft Training Plans: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
   1. Submit not less than four weeks prior to start of training.
   2. Revise and resubmit until acceptable.
   3. Provide an overall schedule showing all training sessions.
   4. Include at least the following for each training session:
      a. Identification, date, time, and duration.
      b. Description of products and/or systems to be covered.
      c. Name of firm and person conducting training; include qualifications.
      d. Intended audience, such as job description.
      e. Objectives of training and suggested methods of ensuring adequate training.
      f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
      g. Media to be used, such a slides, hand-outs, etc.

h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.

C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
1. Include applicable portion of O&M manuals.
2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
3. Provide one extra copy of each training manual to be included with operation and maintenance data.

D. Training Reports:
1. Identification of each training session, date, time, and duration.
2. Sign-in sheet showing names and job titles of attendees.
3. List of attendee questions and written answers given, including copies of and references to supporting documentation required for clarification; include answers to questions that could not be answered in original training session.
4. Include Tomball ISD's formal acceptance of training session.

E. Video Recordings: Submit digital video recording of each demonstration and training session for Owner's subsequent use.
1. Format: DVD Disc.
2. Label each disc and container with session identification and date.
3. Provide sign-off sheets in the closeout documents indicating the individuals who were in attendance at each of the training sessions.

1.04 QUALITY ASSURANCE

A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 DEMONSTRATION - GENERAL

A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.

B. Demonstrations conducted during Functional Testing need not be repeated unless Owner personnel training is specified.

C. Demonstration may be combined with Owner personnel training if applicable.

D. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
1. Perform demonstrations not less than two weeks prior to Substantial Completion.
2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

E. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.02 TRAINING - GENERAL

A. Conduct training on-site unless otherwise indicated.

B. Owner will provide classroom and seating at no cost to Contractor.

C. Do not start training until Functional Testing is complete, unless otherwise specified or approved by the Tomball ISD.

D. Provide training in minimum two hour segments.

E. The Tomball ISD is responsible for determining that the training was satisfactorily completed.

F. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.

G. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
   1. The location of the O&M manuals and procedures for use and preservation; backup copies.
   2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
   3. Typical uses of the O&M manuals.

H. Product- and System-Specific Training:
   1. Review the applicable O&M manuals.
   2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
   3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
   4. Provide hands-on training on all operational modes possible and preventive maintenance.
   5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
   6. Discuss common troubleshooting problems and solutions.
   7. Discuss any peculiarities of equipment installation or operation.
   8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
   9. Review recommended tools and spare parts inventory suggestions of manufacturers.
   10. Review spare parts and tools required to be furnished by Contractor.
   11. Review spare parts suppliers and sources and procurement procedures.

I. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

J. Contractor must have written approval from the Owner and Architect to forgo any required trainings.

END OF SECTION

SECTION 03 1000
CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Formwork for cast-in place concrete.

B. Form accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 2000 - Concrete Reinforcing.

B. Section 03 3000 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

A. ACI 117 - Specification for Tolerances for Concrete Construction and Materials; 2010 (Reapproved 2015).

B. ACI 301 - Specifications for Concrete Construction; 2020.

C. ACI 318 - Building Code Requirements for Structural Concrete; 2019 (Reapproved 2022).

D. ACI 347R - Guide to Formwork for Concrete; 2014 (Reapproved 2021).

E. PS 1 - Structural Plywood; 2019.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on void form materials and installation requirements.

C. Shop Drawings: Indicate pertinent dimensions, materials, bracing, arrangement of joints and ties, and minimum soil retainer bearing lengths above the bottom of the grade beam and below the bottom of the void as calculated per the formowrk accessories section below.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver prefabricated forms and installation instructions in manufacturer's packaging.

B. Store prefabricated forms off ground in ventilated and protected manner to prevent deterioration from moisture.

C. Protect plastic foam products from damage and exposure to sunlight.

PART 2 PRODUCTS

2.01 FORMWORK - GENERAL

A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish cast-in-place concrete work.

B. Design and construct concrete that complies with design with respect to shape, lines, and dimensions.

C. Comply with relevant portions of ACI 301, ACI 301, and ACI 301.

2.02 WOOD FORM MATERIALS

A. Wood forms for unexposed concrete surfaces - No. 2 Common Southern Yellow Pine Lumber or other material of equal qualifications of sufficient thickness to be capable of sustaining the loads to be imposed thereon, dressed to uniformly smooth contact surfaces.

B. Wood forms for exposed concrete surfaces - Commercial Standard Douglas Fir, moisture-resistant, concrete form plywood with one smooth face.

2.03 FORMWORK ACCESSORIES

A. Form Release Agent: Capable of releasing forms from hardened concrete without staining or discoloring concrete or forming bugholes and other surface defects, compatible with concrete and form materials, and not requiring removal for satisfactory bonding of coatings to be applied.
   1. Composition: Colorless mineral oil-based compound.

B. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.

C. Joint Filler: Nonextruding, resilient asphalt impregnated fiberboard or felt, complying with ASTM D 1751, 1/2 inch thick and full depth of slab less 1/2 inch .

D. Waterstops: See section 03 3000 - Cast-in-Place Concrete.

E. Expanded Polystyrene (EPS) Geofoam:
   1. Lightweight expanded polystyrene with a minimum compressive strength of 2.2 pounds per square inch (psi) at a 1% deformation.
   2. Geofoam shall be in compliance with ASTM D 6817.
   3. Geofoam shall be shaped to provide continuous support for raised slabs or to act as a lightweight fill material at locations indicated on the drawings.
   4. Manufacturers:
      a. Foam-Control EPS Geofoam, AFM Corporation: www.geofoam.com
      b. InsulFoam GF, Insulfoam, LLC.: www.insulfoam.com
      c. Therma Foam: www.thermafoam.com

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.02 EARTH FORMS

A. Earth formed grade beams allowed only where noted in the Structural Drawings. Grade beams shall be FORMED ON ALL structural slabs and exposed conditions. Hand trim sides and bottom of earth forms. Remove loose soil prior to placing concrete.

3.03 ERECTION - FORMWORK

A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.

B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.

C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.

D. Refer to the Civil Drawings for construction joint requirements at flatwork.

E. Construction joints: Locate construction joints in concrete as indicated. Contractor shall obtain written approval for all construction joints not shown on Drawings for structural concrete. Distance between construction joints shall be arranged so that the greatest horizontal dimension (including diagonal measurement) for slab pours shall not exceed 200 feet. Provide keyways and extra dowels at all joints. Provide longitudinal keys at joints.

F. Expansion joints: Expansion joints shall consist of joint fillers with sealant. Install filler strips 3/4" below finished surfaces. Clean grooves when surface is dry of foreign matter, loose particles and concrete protrusions; then fill approximately flush with joint sealant to be slightly concave after drying. Finish edges of exposed concrete along expansion joints around all fixed objects within or abutting concrete.

G. If formwork is placed after reinforcement, resulting in insufficient concrete cover over reinforcement, request instructions from Architect/Engineer before proceeding.

3.04 APPLICATION - FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

C. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.05 FORMWORK TOLERANCES

A. Construct formwork to maintain tolerances required by ACI 117, unless otherwise indicated.

B. Construct and align formwork for elevator hoistway in accordance with ASME A17.1.

3.06 FIELD QUALITY CONTROL

A. A special inspections and testing agency (SITA) will perform field quality control tests and inspections, as specified in Sections 01 4516 and 01 4533.

B. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and to verify that supports, fastenings, wedges, ties, and items are secure.

C. Do not reuse wood formwork more than 2 times for concrete surfaces to be exposed to view. Do not patch formwork.

3.07 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.

B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

C. Store removed forms to prevent damage to form materials or to fresh concrete. Discard damaged forms.

END OF SECTION

SECTION 03 2000
CONCRETE REINFORCING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Reinforcing steel for cast-in-place concrete.

B. Supports and accessories for steel reinforcement.

1.02 RELATED REQUIREMENTS

A. Section 03 1000 - Concrete Forming and Accessories.

B. Section 03 3000 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

A. ACI 301 - Specifications for Concrete Construction; 2020.

B. ACI 318 - Building Code Requirements for Structural Concrete; 2019 (Reapproved 2022).

C. ACI SP-66 - ACI Detailing Manual; 2004.

D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2022.

E. ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement; 2016.

F. CRSI (DA4) - Manual of Standard Practice; 2024.

G. CRSI (P1) - Placing Reinforcing Bars, 10th Edition; 2019.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Include bar schedules, shapes of bent bars, spacing of bars, location of splices and embedded metal assemblies.

C. Manufacturer's Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.

D. Reports: Submit certified copies of mill test report of reinforcement materials analysis.

1.05 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 318, ACI 318, ACI 301, ACI 318, and ACI 318.
   1. Maintain one copy of each document on project site.

B. Provide Architect with access to fabrication plant to facilitate inspection of reinforcement. Provide notification of commencement and duration of shop fabrication in sufficient time to allow inspection.

C. Welders' Certificates: Submit certifications for welders employed on the project, verifying AWS qualification within the previous 12 months.

PART 2 PRODUCTS

2.01 REINFORCEMENT

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
   1. Deformed billet-steel bars.
   2. Unfinished.
   3. Splicing of pier reinforcement shall not be permitted.

B. Weldable Reinforcing Steel: ASTM A 706, deformed low-alloy steel bars.
   1. Unfinished.

C. Steel Welded Wire Reinforcement (WWR): Plain Type; 1.
   1. Form: Flat Sheets.

D. Reinforcement Accessories:
   1. Tie Wire: Annealed, minimum 16 gage, 0.0508 inch.
   2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement. At slabs, supports shall not be further than 48 inches apart, each way.
   3. Provide plastic or plastic coated steel components for placement within 1-1/2 inches of weathering surfaces.

2.02 FABRICATION

A. Fabricate concrete reinforcing in accordance with ACI SP-66 - ACI Detailing Manual.

B. Welding of reinforcement is not permitted, unless explicitly indicated on Structural Drawings

C. Locate reinforcing splices not indicated on drawings at point of minimum stress.
   1. Review locations of splices with Architect.
   2. Approved patented type splices (No Electric Arc Welding Permitted) may be used instead of lap splices.
   3. Any bar may be field bent one time without notfiying the Structural Engineer, unless noted otherwise on the Structural Drawings. Reinforcement smaller than #4 bars shall be cold bent. Reinforcement greater than #4 bars shall be bent with heat in the field. Heating shall be controlled by temperature indicating crayons and shall reach a maximum temperature of 1500 degrees Farenheit. Reinforcement shall not be artificially cooled until temperature has reduced naturally to below 600 degrees Farenheit. Bends shall be gradual and care shall be taken to prevent heating or cracking of concrete. If reinforcement must be field bent more than once, the Contractor shall issue an RFI indicating which bars need to be field bent additionally.

PART 3 EXECUTION

3.01 PLACEMENT

A. Place, support and secure reinforcement against displacement. Do not deviate from required position.

B. Do not displace or damage vapor barrier.

C. Accommodate placement of formed openings.

D. Placement of reinforcing steel shall be done in cooperation with requirements of other trades. No cutting of reinforcement or displacement of bars shall be done by any of the trades without the consent of the Architect, and then only when adequate reinforcement is provided to replace the design requirements.

E. Use templates to locate all column and footing dowels.

F. Maintain concrete cover around reinforcing as indicated on drawings.

G. Bond and ground all reinforcement to requirements of Section 26 0526.

3.02 FIELD QUALITY CONTROL

A. A special inspections and testing agency (SITA) will perform field quality control tests and inspections, as specified in Sections 01 4516 and 01 4533.

END OF SECTION

SECTION 03 3000
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete building frame members.

B. Concrete for composite floor construction.

C. Floors and slabs on grade.

D. Concrete Floor Topping and Feathering Material.

E. Joint devices associated with concrete work.

F. Miscellaneous concrete elements, including equipment pads, equipment pits, light pole bases, flagpole bases, thrust blocks, and manholes.

G. Concrete curing.

H. Under-Slab Vapor Barrier

I. Concrete Mix Design Requirements

1.02 COORDINATION OF CIVIL AND STRUCTURAL CONCRETE SPECIFICATIONS

A. This specification section applies to all concrete designs provided on the Structural Drawings. For clarification, this specification section applies to interior and exterior concrete designs provided on the Structural Drawings (possibly including but not limited to sidewalks, patios, pavement, ramps, stairs, retaining walls, etc.). For exterior concrete designs not shown on the Structural Drawings but shown on the Civil Drawings, the provisions of this specification section only applies when there is not a conflicting specification elsewhere in in the Project Manual or Civil Drawings.

1.03 RELATED REQUIREMENTS

A. Section 03 1000 - Concrete Forming and Accessories: Forms and accessories for formwork.

B. Section 03 2000 - Concrete Reinforcing.

C. Section 03 3543 - Bonded Abrasive Polished Concrete Floors

1.04 REFERENCE STANDARDS

A. ACI 302.2R - Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials; 2006.

B. ACI PRC-211.1 - Selecting Proportions for Normal-Density and High Density-Concrete - Guide; 2022.

C. ACI PRC-302.1 - Guide to Concrete Floor and Slab Construction; 2015.

D. ACI SPEC-301 - Specifications for Concrete Construction; 2020.

E. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2018.

F. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2024.

G. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2023.

H. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2020.

I. ASTM C150/C150M - Standard Specification for Portland Cement; 2022.

J. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2024a.

K. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a (Reapproved 2016).

L. ASTM C330/C330M - Standard Specification for Lightweight Aggregates for Structural Concrete; 2023.

M. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2019, with Editorial Revision (2022).

N. ASTM C595/C595M - Standard Specification for Blended Hydraulic Cements; 2021.

O. ASTM C618 - Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2023, with Editorial Revision.

P. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2017.

Q. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Asphalt Types); 2023.

R. ASTM E154/E154M - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover; 2008a (Reapproved 2019).

S. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2018a.

T. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017 (Reapproved 2023).

U. ASTM F1249 - Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor; 2025.

V. COE CRD-C 48 - Handbook for Concrete and Cement Standard Test Method for Water Permeability of Concrete; 1992.

W. COE CRD-C 572 - Handbook for Concrete and Cement Corps of Engineers Specifications for Polyvinylchloride Waterstop; 1974.

X. ICC-ES AC380 - Acceptance Criteria for Termite Physical Barrier Systems; 2021, with Editorial Revision (2022).

Y. NSF 61 - Drinking Water System Components - Health Effects; 2022, with Errata.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. The Contractor shall submit all proposed mix designs in accordance with ACI 301 to the Architect for review before use. Each mix design shall clearly identify where the Contractor proposes use, such as indicating “Drilled Piers”, “Auger Cast-In-Place Piles”, “Concrete Columns”, “Insulating Concrete Formed Walls”, "Cast-In-Place Concrete Retaining Walls", "Precast Tilt Wall Panels", “Light Pole Bases”, “Grade Beams”, “Interior Slabs on Grade & Interior Slabs on Metal Deck”, “Interior Slabs on Void Boxes and Interior Slabs on Temporary Formwork”, “Exterior Slabs on Grade, Exterior Slabs on Metal Deck and Miscellaneous Concrete”, “Exterior Slabs on Void Boxes and Exterior Slabs on Temporary Formwork”, "Storm Shelter Roof Topping Slab", “Greenhouse Foundations”, “Freezer Slabs & Cooler Slabs”, “Crawlspace Mudslab”, etc. Failure to clearly identify where mixes are proposed for use is a suitable reason for rejection. To expedite approval it is suggested that all mix designs related to Structural items be submitted separately from all mix designs related to Civil items as these two categories are reviewed by different parties. Furthermore, to expedite approval, it shall be permitted to email Structural Mix Designs directly to the Structural Engineer or Record and request approval.

C. It shall be required to submit new mix designs for approval when changes to brand, type, size, or source of cementitious material, aggregates, water, ice, or admixtures are proposed or necessary.

D. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.

1. For curing compounds, refer to Submission requirements below before products shall be permitted and provide letters of acceptance from the flooring subcontractor and provide data on method of removal in the event of incompatibility with floor covering adhesives.
2. Concrete Admixtures: For each proposed mix design, provide a written statement from each admixture manufacturer that is used in the concrete mixture that:
    a. Each mixture meets the governing ASTM standing for the admixture.
    b. The manufacturer's understanding of the intended use of the admixture (e.g. air entraining agent, water reducing agent, retarding agent, etc.), the manufacturer's understanding of the purpose range of dosages in the concrete mixture, and that the manufacturer recommends the use of the proposed admixture(s) or the intended purpose.
    c. Each proposed admixture is compatible with each of the constituents of the mixture (e.g Type of cement, and supplementary cementitious materials, other proposed admixtures in the mix, etc).
    d. The proposed combination of admixtures will not result in effects that are detrimental to the strength, workability, or durability of the concrete.
    e. The proposed combination of admixtures will not increase the shrinkage potential of the concrete mixture from that of the concrete mixture without any admixtures.
    f. The use of the proposed admixtures will not cause the concrete to have a chloride ion content greater than specified.
    g. The proposed admixtures do not contain more than 25% lignosulfonates.
3. For vapor barriers, submit all of the following:
    a. Product data and installation instructions.
    b. Documentation from the manufacturer or patent-holder indicating that:
        1) The product is a minimum 15 mil product;
        2) The product is suitable for installation in contact with soil or granular fill under concrete slabs;
        3) Where a concrete-adhering tape is specified for use (e.g. over voidforms), both the vapor barrier product manufacturer or patent-holder and the concrete-adhering tape manufacturer or patent-holder have indicated that the concrete-adhering tape is compatible with the submitted vapor barrier product, and that test data indicates the tape will adhere to the concrete with a minimum 12 pounds per linear inch of tape.
    c. Documentation from an independent agency indicating that:
        1) The independent agency is a testing firm or professional engineering firm which shares no ownership with the product manufacturer or patent-holder;
        2) The independent agency randomly selected the samples for testing from one or more warehouses (or other distribution locations) and then shipped the samples to one or more testing laboratories;
        3) Testing was completed within four years before construction proposals are due for this project, by one or more independent testing laboratories;
        4) The testing fully complied with ASTM E 1745 or identifying any deviations from ASTM E 1745 (including deviations from any documents referenced by ASTM E 1745), with permeance testing having at least two sample replicates (instead of the three required by ASTM E 1745) for each of the five permeance testing scenarios required (baseline and the four conditions required by ASTM E 154 Sections 8, 11, 12 and 13);
        5) The puncture, tensile strength and permeance results of the testing comply with the requirements for a 15 mil, Class A vapor barrier according to ASTM E 1745; and,

6) The average permeance of all samples tested for each of the five permeance testing scenarios is less than or equal to 0.010 Perms [grains/(sq ft*hr*in.Hg)] (with the permeance results being considered to the nearest 0.001 Perm) per ASTM F 1249 after mandatory conditioning tests per ASTM E 154 Sections 8, 11, 12 and 13.

E. Saw-Cut Plans: Submit proposed saw-cut locations for slab on grade and topping slabs to the architect and structural engineer of record. Saw-cuts in slab over void space are not permitted.

F. Control Joint Plans: Submit proposed control joint locations to the structural engineer of record.

G. Samples: Submit samples of underslab vapor barrier and tape to be used if making a substitution request.

H. Test Reports: Submit report for each test or series of tests specified.

I. Manufacturer's Installation Instructions: For concrete accessories, indicate installation procedures and interface required with adjacent construction.

J. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

1.06 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301 and ACI 318.
   1. Maintain one copy of each document on site.

B. Follow recommendations of ACI 305R when concreting during hot weather.

C. Follow recommendations of ACI 306R when concreting during cold weather.

D. For slabs that require under slab vapor barriers, Contractor shall contact manufacturer to schedule a pre-construction meeting and to coordinate a review, in-person or digital, of the vapor barrier installation.

PART 2 PRODUCTS

2.01 FORMWORK

A. Comply with requirements of Section 03 1000.

2.02 REINFORCEMENT MATERIALS

A. Comply with requirements of Section 03 2000.

2.03 CONCRETE MATERIALS

A. Cement: ASTM C150 or ASTM C 1157, Type I/II Portland type.
   1. Acquire cement for entire project from same source.

B. Blended Hydraulic Cement: ASTM C595/C595M, Type IL Portland-Limestone Cement
   1. Acquire cement for the entire project from the same source.

C. Fine and Coarse Aggregates: ASTM C33/C33M (Except as Noted)
   1. Acquire aggregates for entire project from same source.
   2. Fine aggregate:
      a. Provide washed natural or manufactured sand having strong, hard, durable particles, and containing not more than 2% by weight of deleterious matter such as clay lumps, mica, shale, or schist.
   3. Coarse aggregate:
      a. Provide coarse aggregate consisting of clean, hard, find grained, sound crushed rock or washed gravel, or a combination of both, containing not more than 5% by weight of flat, chip-like, thin, elongated, friable, or laminated pieces, nor more than 2% by weight of shale or cherty material.

b. Unless noted otherwise, the nominal aggregate size shall be the largest practicable size for each condition of placement, subject to the lesser of the following maximum size limitations:
   1) 3/4" for slabs over void boxes and slabs on metal deck
   2) 3/8" for Tilt-up concrete wall panels
   3) In all cases, do not exceed 3/4 of the clear distance between reinforcing bars, 3/4 of the specified clear cover, 1/5 of the narrowest dimension between sides of forms, or 1/3 of the depth of any slab section.

c. For each mix design submittal (excluding pavement designed by the Civil Engineer and shown on the Civil Drawings): The concrete supplier shall provide a combined (coarse and fine) sieve analysis for the proposed aggregate blend, using sieve data measured within the past 3 months. It shall be permitted for the concrete supplier to submit a combined sieve analysis that is calculated based on individual sieve analyses.
   1) The combined sieve analysis shall show the percent retained on each sieve (not the cumulative percent retained) and shall meet the following requirements:
      (a) Sizes: 1 1/2", 1", 3/4", 1/2", 3/8", #4, #8, #16, #30, #50, #100, #200.
      (b) No sizes other than those listed shall be on the analysis.
      (c) 0% shall be retained on the 1 1/2" sieve.
      (d) 0% to 16% shall be retained on the 1" sieve.
      (e) 0% to 20% shall be retained on the 3/4" sieve.
      (f) 4% to 20% shall be retained on the 1/2", 3/8", #4, #30, and #50 sieves.
      (g) 0% to 12% on the #8 and #16 sieves.
      (h) 0% to 16% shall be retained on the 1" sieve.
      (i) 5% to 10% shall be retained on the #100 sieve.
      (j) 0% to 2% on the #200 sieve.
      (k) The combined percent retained on the #30, #50, #100, and #200 sieve shall be 25% to 40%.
      (l) The combined percent retained on the #8, #16, and #30 sieves shall not be greater than 20%.
         (1) Exception: The percent retained shall be 0% for all sieves larger than the specified nominal maximum aggregate size for an individual mix.
   2) If the percent retained requirements above cannot be met by using multiple aggregate piles from the plant, the Contractor shall assume for bidding purposes that outside sources will be required.
   3) The requirements of the combined sieved analysis set forth in item 1 may exceed or be more stringent than the requirements set forth in ASTM C33/C33M
   4) When concrete is pumped, the inside diameter of the pipeline shall be a minimum of 3-times the specified maximum nominal aggregate size. Do not use smaller aggregate sizes to accommodate smaller pipe diameters.

D. Lightweight Aggregate: ASTM C330/C330M.

E. Fly Ash: ASTM C618 C or F

F. Water: ASTM C94/C94M or potable.

G. Concrete Floor Topping and Feathering Material:
   1. This item applies to concrete topping slabs with a thickess of 3-inches or less
   2. At feathered locations, provide cement-based self-leveling underlayment.
   3. Provide manufacturer's recommended primer for standard absorbent concrete.
   4. Aggregate shall be well graded, washed gravel (1/8" to 1/4" or larger) for use when underlayment is installed over 1 1/2" thick.
   5. Water shall be clean, potable, and sufficiently cool (not warmer than 70°F).

6. Acceptable Manufacturers: Subject to compliance with requirements herein, provide products from one of the following manufacturers.
    a. Ardex Engineered Cements: www.ardex.com
    b. (Level-Right) Maxxon Corporation: www.level-right.com
    c. Bonsal American: www.bonsal.com
    d. Substitutions: See Section 01 6000 - Product Requirements.

2.04 ADMIXTURES

A. Do not use chemicals that will result in soluble chloride ions in, including calcium chloride, excess of 0.1 percent by weight of cement.

B. Dispense in compliance with manufacturer's recommendations with particular attention to possible undesirable chemical reaction between products when mixed in concentrated form.

C. Do not use admixtures that contain more than 25% lignosulfonates.

D. Do not use admixtures or a combination of admixtures that will increase the shrinkage potential of concrete.

E. Air Entrainment Admixture: ASTM C260/C260M.

F. High Range Water Reducing Admixture: ASTM C494/C494M Type F.
    1. Manufacturers:
        a. MasterGlenium 1466 by BASF Corporation.
        b. Substitutions: See Section 01 6000 - Product Requirements.

G. Mid-Range Water Reducing Admixture: Complying with ASTM C494/C494M Type A and/or Type F and having a maximum of 25% lignosulfonates.
    1. Manufacturers:
        a. POLYHEED 1020 by Degussa Admixtures
        b. SIKAMENT 686 by Sika (214) 878-3669
        c. PLASTOL 341 by Euclid Chemical Co. (216) 531-9222
        d. POZZOLITH 200N by BASF Corporation
        e. MasterGlenium 1466 by BASF Corporation
        f. Substitutions: See Section 01 6000 - Product Requirements. A letter from the manufacturer will be required indicating that the material does not have more than 25% lignosulfonates.

2.05 ACCESSORY MATERIALS

A. Underslab Vapor Barrier shall meet all of the following requirements:
    1. The product shall be a minimum 15 mil product.
    2. The product shall be suitable for installation in contact with soil or granular fill under concrete slabs according to the manufacturer or patent-holder.
    3. Terminate vapor barrier at building perimeter and interior pilasters, pier caps, or footings per manufacturer’s recommendations. Do not install vapor barrier between concrete interface at construction joints (e.g. between perimeter grade beam and slab or between pilasters/pier caps and slabs).

4. Within four years before construction proposals are due for this project, an independent agency (a testing firm or professional engineering firm which shares no ownership with the product manufacturer or patent-holder) shall have randomly selected the samples for testing from one or more warehouses (or other distribution locations) not wholly, or partially owned by the manufacturer, and then shipped the samples to one or more testing laboratories which then completed testing in compliance with ASTM E 1745 having at least two sample replicates (instead of the three required by ASTM E 1745) for each of the five permeance testing scenarios required (baseline and the four conditions required by ASTM E154/E154M Sections 8, 11, 12 and 13), with the puncture, tensile strength and permeance results of the testing complying with the requirements for a 15 mil, Class A vapor barrier according to ASTM E1745, and the average permeance of all samples tested for each of the five permeance testing scenarios being less than or equal to 0.010 Perms [grains/(sq ft*hr*in.Hg)] (with the permeance results being considered to the nearest 0.001 Perm) per ASTM F1249 after mandatory conditioning tests per ASTM E 154 Sections 8, 11, 12 and 13. Provide third party documentation that all testing was performed on a single production roll per ASTM E1745 Section 8.1
5. Accessory Products: At slabs on grade and over the subgrade of all crawlspaces, install vapor barrier manufacturer’s recommended tape for sealing perimeter, seams and penetrations in vapor barrier. At slabs poured over carton void forms, install the vapor barrier over the Masonite and tape all joints (and tape the perimeter of the vapor barrier under the slab area) with a tape that bonds to the concrete with a minimum tensile strength of 2 psi (12 lbf/in using a 6” wide tape) equal to Stego Crete-Claw Tape as manufactured by Stego Industries (877) 464-7834 and if the same manufacturer does not provide both the vapor barrier and the tape, a letter from both manufacturers of the vapor barrier and tape shall be submitted to the Architect indicating that both products are compatible. At all areas where vapor barrier is installed, install the vapor barrier manufacturer’s recommended adhesive, mastic, prefabricated boots, etc.
6. Manufacturers and/or Patent-Holders: The following manufacturer(s) are approved, with manufacture's test data expiration date as indicated. Products listed below may not be used if manufacture's test data has expired.
    a. Poly-America; Husky Yellow Guard 15-mil Vapor Barrier: www.yellowguard.com/#sle. (Manufacture's test expires June 2027.)
    b. Stego Industries, LLC: www.stegoindustries.com. (Stego 15 mil - Class A) (Manufacture's test expires in March 2025)
    c. Substitutions: See Section 01 6000 - Product Requirements.

B. At slabs over crawlspace, unless specifically noted otherwise, crawlspace shall consist of 3" thick unreinforced mud slab. If crawlspace grading indicates locations where mud slab is not required, provide vapor barrier noted above covered with 2" of 3/8" diameter pea gravel.

2.06 BONDING AND JOINTING PRODUCTS

A. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059/C1059M, Type II.

B. Epoxy Bonding System:
1. Complying with ASTM C881/C881M and of Type required for specific application.

C. Waterstops: Self-sealing, non-swelling preformed joint sealant.
1. Single component, self-sealing adhesive compound, extruded in a square cross-section between two quick-release protective wrappers.
    a. Meets Federal Specification SSS-210
    b. Certified NSF/ANSI Standard 61 for use in potable water systems
    c. Manufacturers:
        1) Henry Company; Synko-Flex Waterstop: www.us.henry.com
        2) Substitutions: See Section 01 6000 - Product Requirements.
2. Flexible PVC Waterstop. Dumbbell Configuration.

a. Certified NSF/ANSI Standard 61 for use in potable water systems
b. Manufacturers:
1) Sika USA; Greenstreak Waterstop: usa.sika.com
2) Substitutions: See Section01 6000-Product Requirements.

D. Reglets: See Section 03 1000 - Concrete Forming and Accessories

E. Joint Filler: See Section 03 1000 - Concrete Forming and Accessories

F. Slab Construction Joint Devices: See Section 03 1000 - Concrete Forming and Accessories

2.07 CURING MATERIALS

A. Evaporation Reducer: Liquid thin-film-forming compound that reduces rapid moisture loss caused by high temperature, low humidity, and high winds; intended for application immediately after concrete placement.
1. Manufacturers:
a. W. R. Meadows, Inc; Evapre or Evapre-RTU: www.wrmeadows.com/#sle.

B. At all building slabs, except locations where a "sealer" is shown on the Architectural Drawings: Wet Curing with Potable Water that is not detrimental to concrete.
1. Unless otherwise approved as a substitution request, Proposers shall assume for Proposal purposes that curing compounds shall not be used anywhere on this project and that only wet curing shall be permitted. However, if requested as a substitution request, the Architect may elect to permit this material at certain locations if the Contractor verifies that the warranty will be met: Curing Compound, Naturally Dissipating, Clear, water-based, liquid membrane-forming compound, that dissipates within 3 to 5 weeks; complying with ASTM C309.Note: Many flooring installer Subcontractors will no longer warranty flooring if any kind of curing compound is used! It is the Contractor's responsibility for verifying compatibility of flooring materials and adhesives with any proposed curing compound before proposing curing compounds.

C. At all building slabs where a "sealer" is shown on the Architectural Drawings: Curing and Sealing Compound, Semi-Gloss: Liquid, membrane-forming, dries clear, non-yellowing acrylic-based polymer; complying with ASTM C1315 Type 1 Class A.
1. Vehicle: Solvent-based.
2. Solids by Mass: 25 percent, minimum.
3. VOC Content: Ozone Transport Commission (OTC) compliant.
4. Manufacturers:
a. BASF; MasterKure CC 250 SB: www.master-builders-solutions.basf.us
b. W.R. Meadows, Inc.; CS-309-25 OTC: www.wrmeadows.com.
c. Substitutions: See Section 01 6000 - Product Requirements.

2.08 CONCRETE MIX DESIGN REQUIREMENTS

A. Note to Building Official: The specified air contents for this project are based on the interpretation that all concrete on this project is under Exposure Category F0 conditions in which Freezing and Thawing concerns are "Not Applicable". The International Building Code requires that air contents of concrete be within ranges specified by ACI 318 for various Exposure Categories depending on the probability of exposure to moisture before freezing, and probability of cycles of freezing and thawing. ACI Commentary describes F0 as concrete that will not be exposed to cycles of freezing; F1, exposed to cycles of freezing and thawing that will be occasionally exposed to moisture before freezing; F2, exposed to cycles of freezing and thawing that is in continuous contact with moisture before freezing; and F3, similar to F2 with exposure to deicing chemicals. The "not applicable" interpretation for this project is based on the very limited number of freeze thaw cycles that are likely to occur at this project and based on the consideration that high air contents can cause problems such as cracking and surface delamination.

B. Refer to the schedule of mixes at the end of this specification section for requirements specific to different applications. It shall be permitted to submit to the Engineer any desired proprietary designs which deviate from the schedule of mixes if and only if all deviations from the schedule are clearly noted and if test data is provided indicating the performance of the concrete with regard to slump versus time, strength versus time, and air content.

C. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.

D. Establish required average strength for each type of concrete on the basis of field experience, as specified in ACI 301. It shall be an obligation of the Contractor to produce and deposit concrete that will exceed specified strength twenty-eight days after placing. Concrete falling below specified strength required by ACI 318, as shown by cylinder test shall be removed by the Contractor and be replaced with concrete at specified strength at no cost to the Owner unless otherwise approved by the Engineer after evaluation.

E. Concrete may be proportioned and mixed at the job, dry-batched and mixed at the job or be procured from a ready-mixed concrete plant. Whatever the method of production, concrete materials and concrete shall be stored handled and mixed in conformance with all requirements of ASTM C94, which apply to the particular method selected.

F. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.

G. Aggregate: As specified in Section 2.03 B.

2.09 MIXING

A. Transit Mixers: Comply with ASTM C94/C94M.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 PREPARATION

A. Formwork: Comply with requirements Section 03 1000 - Concrete Forming and Accessories.

B. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.
   1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.
   2. Use latex bonding agent only for non-load-bearing applications.
   3. At intersections of pours for concrete walls and beams (including foundation elements such as grade beams), install a 1 1/2" deep keyway that is a minimum of 1/3 the thickness and 1/3 the height (unless otherwise noted) and roughen the exposed surface of the first pour with a minimum 1/4" amplitude.

C. Where new concrete with integral waterproofing is to be bonded to previously placed concrete, prepare surfaces to be treated in accordance with waterproofing manufacturer's instructions. Saturate cold joint surface with clean water, and remove excess water before application of coat of waterproofing admixture slurry. Apply slurry coat uniformly with semi-stiff bristle brush at rate recommended by waterproofing manufacturer.

D. Vapor Barrier: At exterior floor slabs where indicated on the Structural Drawings Sheets and Notes and at all interior floor slabs, a vapor barrier under the floor slab shall be installed in accordance with ASTM E 1643 and as indicated in Part 2 of this Specification Section. Lap joints minimum 6 inches. Repair damaged vapor retarder before covering.
   1. Install compactible granular fill before placing vapor barrier at areas where slabs are poured on grade. Install void boxes and masonite before placing vapor barrier at areas where slabs are to be poured on void boxes. Do not place sand between the vapor barrier and the slab.

3.03 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

A. Comply with requirements of Section 03 2000 - Concrete Reinforcing.

3.04 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.

B. Place concrete for floor slabs in accordance with ACI 302.1R and ACI 302.2R

C. Notify Architect not less than 48 hours prior to commencement of placement operations.

D. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.

E. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.05 SLAB JOINTING

A. Locate joints as indicated on drawings.

B. Anchor joint fillers and devices to prevent movement during concrete placement.

C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.

D. Repair underslab vapor retarder damaged during placement of concrete reinforcing. Repair with vapor retarder material; lap over damaged areas minimum 6 inches and seal watertight.

E. Separate slabs on grade from vertical surfaces with joint filler as indicated on drawings.

F. Place joint filler in floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

G. Extend joint filler from bottom of slab to within 1/2 inch of finished slab surface. Conform to Section 07 9200 for finish joint sealer requirements.

H. Install joint devices in accordance with manufacturer's instructions.

I. Install construction joint devices in coordination with floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

J. Install joint device anchors for expansion joint assemblies specified in Section 07 9513. Maintain correct position to allow joint cover to be flush with floor and wall finish.

K. Apply sealants in joint devices in accordance with Section 07 9200.

L. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

M. Place concrete continuously between predetermined expansion, control, and construction joints.

N. Deposit concrete continuously or in layers of such thickness that no concrete will be deposited on concrete that has hardened sufficiently to cause formation of seams or planes of weakness within sections.

O. Do not interrupt successive placement; do not permit cold joints to occur.

P. Placing of concrete in supported elements shall not be started until concrete previously placed in columns and walls is no longer plastic.

Q. Consolidate concrete by vibration, spading or rodding, so that concrete is thoroughly worked around reinforcement, around embedded items and into corners or forms, eliminating all air or stone pockets that may cause honeycombing, pitting or planes or weakness.

R. Place saw-cuts in slabs-on-grade and topping slabs in saw cut pattern indicated. Saw-cuts in slab over void space are not permitted.

S. Saw cut slab-on-grade and topping slab joints within 4 hours after placing. Use maximum 3/16 inch thick blade, cut into slab 1/4 depth of slab thickness. Saw-cuts in slab over void space are not permitted.

T. Screed slabs on grade level, maintaining surface flatness of maximum 1/4 inch in 10 ft.

3.06 SEPARATE FLOOR TOPPINGS

A. Prior to placing floor topping, roughen substrate concrete surface and, roughen substrate concrete surface and remove deleterious material. Broom and vacuum clean.

B. Place required dividers, edge strips, reinforcing, and other items to be cast in.

C. Apply bonding agent to substrate in accordance with manufacturer's instructions.

D. Apply sand and cement slurry coat on base course, immediately prior to placing toppings.

E. Place concrete floor toppings to required lines and levels.

F. Screed toppings level, maintaining surface flatness of maximum 1:1000.

3.07 FLOOR FLATNESS AND LEVELNESS TOLERANCES

A. Maximum Variation of Surface Flatness:
   1. Exposed Concrete Floors: 1/4 inch in 10 feet.
   2. Under Seamless Resilient Flooring: 1/4 inch in 10 feet.
   3. Under Carpeting: 1/4 inch in 10 feet.

B. Correct the slab surface if tolerances are less than specified.

C. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.08 CONCRETE FINISHING

A. Repair surface defects, including tie holes, immediately after removing formwork.

B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.

C. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as indicated on drawings and as follows:
   1. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.
   2. Grout Cleaned Finish: Wet areas to be cleaned and apply grout mixture by brush or spray; scrub immediately to remove excess grout. After drying, rub vigorously with clean burlap, and keep moist for 36 hours.

D. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
   1. Surfaces to Receive Thick Floor Coverings: "Wood float" as described in ACI 302.1R; thick floor coverings include quarry tile, ceramic tile, and Portland cement terrazzo with full bed setting system.
   2. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 302.1R; thin floor coverings include carpeting, resilient flooring, seamless flooring, resinous matrix terrazzo, thin set quarry tile, and thin set ceramic tile.
   3. Other Surfaces to Be Left Exposed: "Steel trowel" as described in ACI 302.1R, minimizing burnish marks and other appearance defects.
   4. Broom Finish: Ramps, stair treads, sidewalks, porches and docks, concrete pads, Storm Shelter Roof Topping and bases for mechanical equipment. Steel trowel smooth. Brush after troweling with a soft bristle broom to create non skid surfaces perpendicular to the direction of travel.

E. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1:100 nominal.

3.09 CURING AND PROTECTION

A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
   1. Normal concrete: Not less than seven days.

C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.

D. Surfaces Not in Contact with Forms:
   1. Floor and Roof Slabs To Receive Adhesive-Applied Flooring or Roofing: Curing compounds and other surface coatings are usually considered unacceptable by flooring manufacturers, adhesive manufacturers, and roofing installers. If use of such materials is desired by the Contractor, the Contractor shall either obtain the approval of the flooring manufacturer and adhesive manufacturers, or roofing installer prior to use. Alternatively, the Contractor shall remove the surface coating after curing to flooring manufacturer's or roofing installer's satisfaction. Unless otherwise approved as a substitution request, the Contractor shall assume during bidding that curing compounds shall not be used anywhere on this project and that only wet curing shall be permitted. However, if requested by the Contractor as a substitution request or during construction, the Architect may elect to permit this material at certain locations. Generally, the Architect will require a letter from the flooring subcontractor or roofing installer guaranteeing that the curing compound is compatible with the flooring adhesive and flooring materials or roofing system.
   2. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than seven days or until the concrete has reached 70% of the specified 28-day strength by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
      a. Ponding: Maintain 100 percent coverage of water over floor slab areas, continuously.
      b. Spraying: Spray water over floor slab areas and maintain wet.
      c. Saturated Burlap: Saturate burlap-polyethylene and place burlap-side down over floor slab areas, lapping ends and sides; maintain in place.

3.10 FIELD QUALITY CONTROL

A. A Special Inspection and Testing Agency (SITA) will perform field quality control tests and inspections, as specified in Sections 01 4516 and 01 4533.

B. Provide free access to concrete operations at project site and cooperate with appointed firm.

C. Tests of concrete and concrete materials may be performed at any time to ensure compliance with specified requirements.

3.11 DEFECTIVE CONCRETE

A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.

B. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.

C. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

3.12 PROTECTION

A. Do not permit traffic over unprotected concrete floor surface until fully cured.

3.13 SCHEDULE - CONCRETE MIX DESIGN REQUIREMENTS

A. "Augured Cast In Place Pile" Mix: 3,000 psi grout (with sand but not coarse aggregate) measuring grout strength by cubes (2"x2"x2") at 28 days, 10 to 25 second flow rate when using 3/4 inch opening in (Modified corps of Engineers) flow cone, 1.5% +/- 1.5% air content, air entraining agent not required, 0.50 maximum water/cement ratio, up to 20% replacement using class C or F fly ash permitted, mid or high range water reducing agents permitted. Mix shall meet all recommendations of the Deep Foundations Institute.

B. "Cast-In-Place Walls" Mix (e.g. CIP retaining walls, CIP basement walls, etc.): 3,000 psi 28 day concrete, 7" to 9" slump, 5.5% +/- 1.5% air content, minimum 5 sacks of cement per cubic yard with up to 20% replacement of cement with Class C or Class F fly ash permitted, mid-range water reducing agents permitted, high-range water reducing agents not permitted.

C. "Grade Beam and Pilasters" Mix: 3,000 psi 28 day concrete, 4" to 6" slump, 4.5% +/- 1.5% air content using air entraining agent as required, minimum 5 sacks of cement per cubic yard, up to 20% replacement of cement with Class C or Class F fly ash permitted, mid range and high range water reducing agents permitted.

D. "Interior Slabs on Grade and Interior Slabs on Metal Deck" Mix: 3,000 psi 28 day concrete, maximum water to cement ratio of 0.5, 5" to 6" slump (Note: This is more stringent than the default ACI tolerance for slump), 1.5% +/- 1.5% air content, air entraining agent not permitted, minimum 5 sacks of cement per cubic yard with up to 20% replacement using Class C or F fly ash, mid range water reducing agents permitted, high range water reducing agents not permitted. The slab aggregate gradation requirements in Section 2.03 B shall apply. If any portion of concrete is will be permanently in contact with exterior elements, Miscellaneous Concrete mix design shall apply.

E. "Exterior Slabs on Grade, Exterior Slabs on Metal Deck and Miscellaneous Concrete" Mix: 3,000 psi 28 day concrete, maximum water to cement ratio of 0.50, 5" to 6" slump (Note: This is more stringent than the default ACI tolerance for slump), 4.5% +/- 1.5% total air content using air entraining agent, minimum 5 sacks of cement per cubic yard, up to 20% cement replacement using Class C or F fly ash permitted, mid range water reducing agents permitted, high range water reducing agents not permitted. The slab aggregate gradation requirements in Section 2.03 B shall apply.

F. "Freezer Slabs and Cooler Slabs" Mix: 4,500 psi 28 day concrete, maximum water to cement ratio of 0.45, 5" to 6" slump (Note: This is more stringent than the default ACI tolerance for slump), 6.5% +/- 1.5% total air content, minimum 6.5 sacks of cement per cubic yard, up to 20% cement replacement using Class C or F fly ash permitted, mid range water reducing agents permitted, high range water reducing agents not permitted. The slab aggregate gradation requirements in Section 2.03 B shall apply.

END OF SECTION

SECTION 03 3543
BONDED ABRASIVE POLISHED CONCRETE FLOORS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Products and procedures for bonded abrasive polishing concrete floors using multi-step wet/dry mechanical process, and accessories indicated, specified, or required to complete polishing.

1.02 DEFINITIONS

A. Terminology: As defined by CPAA.

B. Polished Concrete: The act of changing a concrete floor surface, with or without aggregate exposure, to achieve a specified level of gloss.

C. Bonded Abrasive Polished Concrete: The multi-step operation of mechanically grinding, honing, polishing of a concrete floor surface with bonded abrasives to cut a concrete floor surface and to refine each cut to the maximum potential to achieve a specified level of finished gloss as defined by the CPAA.

1.03 SUBMITTALS

A. Product Data: Manufacturer’s technical literature for each product indicated, specified, or required. Include manufacturer's technical data, application instructions, and recommendations.

B. Installer Qualifications: Data for company, principal personnel, experience, and training specified in PART 1 “Quality Assurance” Article.

C. Field Quality Control – Dynamic Coefficient of Friction Test Reports: Reports of testing specified in PART 3 “Field Quality Control” Article.

D. Field Quality Control – Static Coefficient of friction test reports: report of testing specified in Part 3 “Field Quality Control” article.

E. Maintenance Data: For inclusion in maintenance manual required by Division 01.
   1. Include instructions for maintenance of installed work, including methods and frequency recommended for maintaining optimum condition under anticipated use.
   2. Include precautions against cleaning products and methods which may be detrimental to finishes and performance.

1.04 QUALITY ASSURANCE

A. Polisher Qualifications:
   1. Experience: Company experienced in performing specified work similar in design, products, and extent to scope of this Project; with a record of successful in-service performance; and with sufficient production capability, facilities, and personnel to produce specified work.
   2. Supervision: Maintain competent supervisor who is at Project during times specified work is in progress, and is currently certified as Craftsman - Level I or higher by CPAA.
   3. Manufacturer Qualification: Approved by manufacturer to apply liquid applied products.

B. Walkway Auditor: Certified by CPAA or NFSI to test bonded abrasive polished concrete floors for dynamic and static coefficient of friction according to ANSI B101.1 and B101.3.

C. Coefficient of Friction: Achieve following coefficient of friction by field quality control testing in accordance to the following standards:
   1. ANSI B101.1 Static Coefficient of Friction - Achieve a minimum of .42 for level floor surfaces.
   2. ANSI B101.3 Dynamic Coefficient of Friction - Achieve a minimum of .35 for level floor surfaces.

D. Field Mock-up: Before performing work of this Section, provide following field mock-up to verify selections made under submittals and to demonstrate aesthetic effects of polishing. Approval does not constitute approval of deviations from Contract Documents, unless Architect specifically approves deviations in writing.
   1. Form, reinforce, and cast concrete slab for 10 foot square field mock-up.
   2. Concrete shall be same mix design as scheduled for Project.
   3. Placement and finishing work shall be performed by same personnel as will place and finish concrete for Project.
   4. Mock-up shall be representative of work to be expected.
   5. Perform grinding, honing, and polishing work as scheduled for Project using same personnel as will perform work for Project.
   6. Approval is for following aesthetic qualities:
      a. Compliance with approved submittals.
      b. Compliance with specified aggregate exposure.
      c. Compliance with specified finished gloss level.
   7. Obtain Architect's approval before starting work on Project.
   8. Protect and maintain approved field mock-ups during construction in an undisturbed condition as a standard for judging completed work.

E. Pre-Installation of Concrete Conference: Prior to placing concrete for areas scheduled for polishing, conduct conference at Project to comply with requirements of applicable Division 01 Sections.
   1. Required Attendees:
      a. Owner.
      b. Architect.
      c. Contractor, including supervisor.
      d. Concrete producer.
      e. Concrete finisher, including supervisor.
      f. Concrete polisher, including supervisor.
      g. Technical representative of liquid applied product manufacturers.
      h. Walkway auditor.
   2. Minimum Agenda: Polisher shall demonstrate understanding of work required by reviewing and discussing procedures for, but not limited to, following:
      a. Tour field mock-up and representative areas of required work, discuss and evaluate for compliance with Contract Documents, including substrate conditions, surface preparations, sequence of procedures, and other preparatory work performed by other installers.
      b. Review Contract Document requirements.
      c. Review approved submittals and field mock-up.
      d. Review procedures, including, but not limited to:
      e. Applicable Division 03 Section on cast-in-place concrete
         1) Specific mix design.
         2) Specified curing methods/procedures.
         3) Projected 3, 10, and 28 day compression strength test related to specified aggregates exposure for finished floor and project phasing.
         4) Protection of concrete substrate during construction and prior to polishing process
         5) Project phasing and scheduling for each step of grinding, honing and polishing operations including, but not limited to:
            (a) Quality of qualified personnel committed to project.
            (b) Quality and size of grinders committed to project.
            (c) Proper disposal of concrete slurry and/or concrete dust.
         6) Details of each step of grinding, honing, and polishing operations.

(a) Application of liquid applied products.
(b) Protecting polished concrete floors after polishing work is complete.

3. Reports: Record discussions, including decisions and agreements reached, and furnish copy of record to each party attending.

1.05 FIELD CONDITIONS

A. Damage and Stain Prevention: Take precautions to prevent damage and staining of concrete surfaces to be polished.
1. Prohibit use of markers, spray paint, and soapstone.
2. Prohibit improper application of liquid membrane film forming curing compounds.
3. Prohibit vehicle parking over concrete surfaces.
4. Prohibit pipe-cutting operations over concrete surfaces.
5. Prohibit storage of any items over concrete surfaces for not less than 28 days after concrete placement.
6. Prohibit ferrous metals storage over concrete surfaces.
7. Protect from petroleum, oil, hydraulic fluid, or other liquid dripping from equipment working over concrete surfaces.
8. Protect from acids and acidic detergents contacting concrete surfaces.
9. Protect from painting activities over concrete surfaces.

B. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting liquid applied product application.

PART 2 – PRODUCTS

2.01 LIQUID APPLIED PRODUCTS

A. Liquid Densifier: An Aqueous solution of Silicon Dioxide dissolved in one of the following Hydroxides that penetrates into the concrete surface and reacts with the Calcium Hydroxide to provide a permanent chemical reaction that hardens and densifies the wear surface of the cementitious portion of the concrete. All of the following have the same chemistry varying only by the alkali used for solubility of the Silicon Dioxide.
1. Sodium Silicate
2. Potassium Silicate
3. Lithium Silicate
4. Alkalis solution of Colloidal Silicates or Silica

2.02 ACCESSORIES

A. Repair Material: A product that is designed to repair cracks and surface imperfections. The specified material must have sufficient bonding capabilities to adhere after the polishing to the concrete surface and provide abrasion resistance equal to or greater than the surrounding concrete substrate.

B. Grout Material: A thin mortar used for filling spaces. Acceptable products shall be:
1. Epoxy, urethane, poluyrea, or polyaspartic resins.
2. Latex or acrylic binders mixed with cement dust from previous grinding steps.
3. Silicate binders mixed with cement dust from previous grinding steps.

C. Protective Cover: Non-woven, puncture and tear resistant, polypropylene fibers laminated with a multi-ply, textured membrane, not less than 18 mils in thickness.

2.03 POLISHING EQUIPMENT

A. Field Grinding and Polishing Equipment:
1. A multiple head, counter rotating, walk behind or ride on machine, of various size and weights, with diamond tooling affixed to the head for the purpose of grinding concrete. Excludes janitorial maintenance equipment.

2. If dry grinding, honing, or polishing, use dust extraction equipment with flow rate suitable for dust generated, with squeegee attachments.
3. If wet grinding, honing, or polishing, use slurry extraction equipment suitable for slurry removal and containment prior to proper disposal.

B. Edge Grinding and Polishing Equipment: Hand-held or walk-behind machines which produces same results, without noticeable differences, as field grinding and polishing equipment.

C. Burnishing Equipment: High speed walk-behind or ride-on machines capable of generating 1000 to 2000 revolutions per minute and with sufficient head pressure of not less than 20 pounds to raise floor temperature by 20 degrees F.

D. Diamond Tooling: Abrasive tools that contain industrial grade diamonds within a bonded matrix (such as metallic, resinous, ceramic, etc) that are attached to rotating heads to refine the concrete substrate.
1. Bonded Abrasive: Abrasive medium that is held within a bonding that erodes away to expose new abrasive medium as it is used.
2. Metal Bond Tooling: Diamond tooling that contains industrial grade diamonds with a metallic bonded matrix that is attached to rotating heads to refine the concrete substrate. These tools are available in levels of soft, medium, and hard metallic matrices that are matched with contrasting concrete substrates (i.e. hard matrix/soft concrete, medium matrix/medium concrete, soft matrix/hard concrete) and are typically used in the grinding and early honing stages of the polishing process.
3. Resin Bond Tooling: Diamond tooling that contains industrial grade diamonds within a resinous bonded matrix (poly-phenolic, ester-phenolic, thermoplastic-phenolic) that is attached to rotating heads to refine the concrete substrate. Resin bond tooling does not have the soft/medium/hard characteristics of metal bond tooling and are typically used for the later honing and polishing stages of the polishing process.
4. Hybrid Tooling: Diamond tooling that combines metal bond and resin bond that has the characteristics of both types of tooling. These types of tools are typically used as either transitional tooling from metal bond tools to resin bond tools or as a first cut tool on smooth concrete surfaces.
5. Transitional Tooling: Diamond tooling that is used to refine the scratch pattern of metal bond tooling prior to the application of resin bond tooling in an effort to extend the life of resin bond tooling and to create a better foundation for the polishing process.
6. Abrasive Pad: An abrasive pad, resembling a typical floor maintenance burnishing pad, that has the capability of refining the concrete surface on a microscopic level that may or may not contain industrial grade diamonds. These pads are typically used for the maintenance and/or restoration of previously installed polished concrete flooring.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Acceptance of Surfaces and Conditions:
1. Examine substrates to be polished for compliance with requirements and other conditions affecting performance.
   a. Concrete Finished Floor Flatness according to applicable Division 03 Section on cast-in-place concrete.
   b. Concrete curing methods according to applicable Division 03 Section on cast-in-place concrete.
   c. Concrete Compression strength per according to applicable Division 03 Section on cast-in-place concrete.

B. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.

C. Starting work within a particular area will be construed as acceptance of surface conditions.

3.02 PREPARATION

A. Cleaning New Concrete Surfaces:
   1. Prepare and clean concrete surfaces.
   2. Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, paint splatter, and other contaminants incompatible with liquid applied products and polishing.

3.03 POLISHING CONCRETE FLOORS

A. Perform all polishing procedures to ensure a consistent appearance from wall to wall.

B. Initial Grinding:
   1. Use grinding equipment with metal or semi-metal bonded tooling.
   2. Begin grinding in one direction using sufficient size equipment and diamond tooling to meet specified aggregate exposure class.
   3. Make sequential passes with each pass perpendicular to previous pass using finer grit tool with each pass, up to 100 grit metal bonded tooling.
   4. Achieve maximum refinement with each pass before proceeding to finer grit tools.
   5. Clean floor thoroughly after each pass using dust extraction equipment properly fitted with squeegee attachment or walk behind auto scrubber suitable to remove all visible loose debris and dust.
   6. Continue grinding until aggregate exposure matches approved field mock-ups.

C. Treating Surface Imperfections:
   1. Mix patching compound or grout material with dust created by grinding operations, manufacturer's tint, or sand to match color of adjacent concrete surfaces.
   2. Fill surface imperfections including, but not limited to, holes, surface damage, small and micro cracks, air holes, pop-outs, and voids with grout to eliminate micro pitting in finished work.
   3. Work compound and treatment until color differences between concrete surface and filled surface imperfections are not reasonably noticeable when viewed from 10 feet away under lighting conditions that will be present after construction.

D. Liquid Densifier Application: Apply undiluted to point of rejection, remove excess liquid, and allow curing according to manufacturers instructions.

E. Grout Grinding:
   1. Use grinding equipment and appropriate grit and bond diamond tooling.
   2. Apply grout, forced into the pore structure of the concrete substrate, to fill surface imperfections.
   3. Clean floor thoroughly after each pass using dust extraction equipment properly fitted with squeegee attachment or walk behind auto scrubber suitable to remove all visible loose debris and dust.

F. Honing:
   1. Use grinding equipment with hybrid or resin bonded tooling.
   2. Hone concrete in one direction starting with a 100 grit tooling and make as many sequential passes as required to remove scratches, each pass perpendicular to previous pass, up to 400 grit tooling reaching maximum refinement with each pass before proceeding to finer grit tooling.
   3. Clean floor thoroughly after each pass using dust extraction equipment properly fitted with squeegee attachment or walk behind auto scrubber suitable to remove all visible loose debris and dust.

G. Polishing:
   1. Use polishing equipment with resin-bonded tooling.
   2. Begin polishing in one direction starting with 800 grit tooling.

3. Make sequential passes with each pass perpendicular to previous pass using finer grit tooling with each pass until the specified level of gloss has been achieved.
4. Achieve maximum refinement with each pass before proceeding to finer grit pads.
5. Clean floor thoroughly after each pass using dust extraction equipment properly fitted with squeegee attachment or walk behind auto scrubber suitable to remove all visible loose debris and dust.
6. Stain Protection: Uniformly apply and remove excessive liquid according to manufacturer's instructions. Final film thickness should be less than .05 mils after cure.
7. Final Polish: Using burnishing equipment and finest grit abrasive pads, burnish to uniform reflective sheen matching approved field mock-up.

H. Final Polished Concrete Floor Finish:
1. Aggregate Exposure Class B - Fine / Sand Aggregate Finish: Remove not more than 1/16 inch of concrete surface by grinding and polishing resulting in majority of exposure displaying fine aggregate with no, or small amount of, medium aggregate at random locations.
2. Finished Gloss Level 3 - Semi-Polished Appearance:
   a. Procedure: Recommended not less than 4 steps with full refinement of each diamond tool with one application of densifier.
   b. Gloss Measurement: Determine the specular gloss by incorporating the following:
      1) Reflective Clarity Reading: Not less than 65 according to ASTM D5767 prior to the application of sealers.
      2) Reflective Sheen Reading: Not less than 35 according to ASTM D523 prior to the application of sealers.

3.04 FIELD QUALITY CONTROL

A. Field Testing: Engage a qualified walkway auditor to perform field testing to determine if polished concrete floor finish complies with specified coefficient of friction;
1. ANSI B101.1 for static coefficient of friction
2. ANSI B101.3 for dynamic coefficient of friction

3.05 CLOSEOUT ACTIVITIES

A. Maintenance Training: CPAA Craftsman shall train Owner's designated personnel in proper procedures for maintaining polished concrete floor.

3.06 PROTECTION

A. Covering: After completion of polishing, protect polished floors from subsequent construction activities with protective covering.

END OF SECTION

SECTION 04 0100
MAINTENANCE OF MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Final cleaning of masonry surfaces.

B. Replacement of masonry units.

C. Repointing mortar joints.

D. Repair of damaged masonry.

1.02 RELATED REQUIREMENTS

A. Section 04 0511 - Masonry Mortaring and Grouting.

B. Section 04 2000 - Unit Masonry: Brick and Block masonry units.

C. Section 04 4313 - Stone Masonry Veneer.

D. Section 04 7200 - Cast Stone Masonry.

1.03 REFERENCE STANDARDS

A. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week prior to commencing work of this section.
   1. Require attendance of parties directly affecting work of this section.
   2. Review conditions of installation, installation procedures, and coordination with related work.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on cleaning compounds and cleaning solutions.
   1. Cleaning Plan: Written description of cleaning process, including materials, methods, equipment, and sequencing of work.

C. Applicator Qualifications: Submit qualifications of applicator.
   1. Certification stating applicator is experienced in the application of the specified products.
   2. List of recently completed masonry cleaning projects, including project name and location, names of owner and architect, description of cleaning products used and substrates, applicable local environmental regulations, and application procedures.

D. Environmental Regulations: Submit description for testing, handling, treatment, containment, collection, transport, disposal, and discharge of hazardous wastes and cleaning effluents. Describe any hazardous materials to be cleaned from substrates. Submit applicable local environmental regulations.

E. Protection: Submit description for protecting surrounding areas, landscaping, building occupants, pedestrians, vehicles, and non-masonry surfaces during the work from contact with masonry cleaners, residues, rinse water, fumes, wastes, and cleaning effluents.

F. Surface Preparation: Submit description for surface preparation of substrates to be completed before application of masonry cleaners.

G. Application: Submit description for application procedures of masonry cleaners.

1.06 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

B. Manufacturer Qualifications:

1. Manufacturer capable of providing field service representation during installation and who will approve the installer and application method.

C. Installer Qualifications:
1. Installer experienced in performing this type of work and who has specialized in work similar to the type required for this project.

D. Pre-installation Meetings
1. Comply with provisions of Section 01 3000 - Administrative Requirements.
a. Applicator and Product representative shall be present during meeting.

1.07 MOCK-UP

A. Test Panels:
1. Before full-scale application, test products to be used on test panels.
2. Review manufacturer's product data sheets to determine suitability of each product for each surface.
3. Apply products using manufacturer-approved application methods, determining actual requirements for application.
4. After 48 hours, review effectiveness of cleaning or treatment, compatibility with substrates, and ability to achieve desired results.
5. Obtain approval by Architect and Owner of workmanship, color, and texture before proceeding with work.
6. Test Panels: Inconspicuous sections of actual construction.
a. Location and number as selected by Architect.
b. Size; 4 feet by 4 feet.
c. Repair unacceptable work to the satisfaction of the Architect and Owner.

B. Acceptable panel and procedures employed will become the standard for work of this section.

C. Mock-up may remain as part of the Work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver masonry neatly stacked and tied on pallets. Store clear of ground with adequate waterproof covering.

B. Store cleaning materials in manufacturer's packaging.

1.09 FIELD CONDITIONS

A. Do not apply products under conditions outside manufacturer's requirements, which include:
1. Surfaces that are frozen; allow complete thawing prior to installation.
2. Surface and air temperatures below 40 degrees F.
3. Surface and air temperatures above 95 degrees F.
4. When surface or air temperature is not expected to remain above 40 degrees F for at least 8 hours after application.
5. Wind conditions that may blow materials onto surfaces not intended to be treated.
6. Less than 24 hours after a rain or 6 hours before rain is expected after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Restoration and Cleaning Chemicals:
1. Diedrich Technologies, Inc: www.diedrichtechnologies.com/#sle.
2. PROSOCO: www.prosoco.com.
3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 CLEANING MATERIALS

A. Water: Clean, potable, and free of oils, acids, alkalis, salts, and organic matter. Use to rinse masonry surfaces and dilute concentrated cleaners.

B. Cleaning Agent: Product types listed are manufactured by Prosoco, inc. as basis of design.

MATERIAL	COLOR/TEXTURE	CLEANER
Brick	Red	600 Detergent
	Light	Vana Trol
	Dark	Vana Trol
	Pavers	600 Detergent
	Glazed	Vana Trol
CMU	Split Face	Custom Masonry Cleaner
	Burnished/Ground Face	Light Duty Concrete Cleaner
Cast Stone	Integral Color	Light Duty Concrete Cleaner
Architectural Concrete	Natural Color	Light Duty Concrete Cleaner
	Textured	Heavy Duty Concrete Cleaner

2.03 MORTAR MATERIALS

A. Comply with requirements of Section 04 0511.

2.04 MASONRY MATERIALS

A. Unit Masonry: Section 04 2000.

B. Cast Stone Masonry: Section 04 7200

C. Stone Veneer: Section 04 4313.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces to be cleaned and restored are ready for work of this section.

B. Do not begin until test panels have been approved by Architect.

3.02 PREPARATION

A. Protect surrounding elements from damage due to restoration procedures.

B. Carefully remove and store removable items located in areas to be restored, including fixtures, fittings, finish hardware, and accessories; reinstall upon completion.

C. Separate areas to be protected from restoration areas using means adequate to prevent damage.

D. Cover existing landscaping with tarpaulins or similar covers.

E. Mask immediately adjacent surfaces with material that will withstand cleaning and restoration procedures.

F. Close off adjacent occupied areas with dust proof and weatherproof partitions.

G. Protect roof membrane and flashings from damage with 1/2 inch plywood laid on roof surfaces over full extent of work area .

H. When using cleaning methods that involve water or other liquids, install drainage devices to prevent runoff over adjacent surfaces unless those surfaces are impervious to damage from runoff.

I. Do not allow cleaning runoff to drain into sanitary or storm sewers.

3.03 REBUILDING

A. Cut out damaged and deteriorated masonry with care in a manner to prevent damage to any adjacent remaining materials.

B. Support structure as necessary in advance of cutting out units.

C. Cut away loose or unsound adjoining masonry and mortar to provide firm and solid bearing for new work.

D. Build in new units following procedures for new work specified in other section(s).

E. Mortar Mix: Colored and proportioned to match existing work.

F. Ensure that anchors, ties, reinforcing, and flashings are correctly located and built in.

G. Install built in masonry work to match and align with existing, with joints and coursing true and level, faces plumb and in line. Build in all openings, accessories and fittings.

3.04 REPOINTING

A. Perform repointing prior to cleaning masonry surfaces.

B. Cut out loose or disintegrated mortar in joints to minimum 1/2 inch depth or until sound mortar is reached.

C. Use power tools only after test cuts determine no damage to masonry units will result.

D. Do not damage masonry units.

E. When cutting is complete, remove dust and loose material by brushing.

F. Premoisten joint and apply mortar. Pack tightly in maximum 1/4 inch layers. Form a smooth, compact concave joint to match existing.

G. Moist cure for 72 hours.

3.05 CLEANING OF MASONRY

A. Comply with provisions of Section 01 7000 - Execution and Closeout Requirements.

B. Clean all exposed surfaces of new masonry of excess mortar, efflorescence, stains, and job dirt, using materials specified.

C. Clean from top down; prevent cleaning materials and rinse water from contacting non-cementitious materials.

D. Clean in accordance with manufacturer's instructions and recommendations, product data, and container label instructions.

E. Mix materials in strict accordance with manufacturer's instructions; do not dilute unless permitted by manufacturer.

F. Prevent overspray, wind drift, and splash onto surfaces not to be treated.

G. No high pressure washers are allowed.

H. Low pressure spray for wetting and rinsing is permitted. Pressure should be in the range of 400-700 psi. Equipment should produce 4-6 gallons of water per minute using a 15-40 degree fan tip (no fan tip less than a 15-degree is allowed).

3.06 AGING

A. Rub in new masonry work to match, as close as possible, adjacent original work.
   1. Use carbon black in small amounts, rubbing in well with burlap rags.

B. After each application, dust off surplus and wash down with low pressure hose. Allow surface to dry before proceeding with succeeding applications.

C. Continue process until acceptance.

3.07 FIELD QUALITY CONTROL

A. Inspection:
   1. Inspect the masonry cleaning work with the Contractor, Architect, applicator, and product representative, and compare with test panel results approved by the Architect. Determine if the substrates are suitably clean.

B. Manufacturers' Field Services
   1. Provide the services of the manufacturer's authorized field representative to verify that installed products comply with manufacturer's requirements and with the standard established by the Architect-approved test panels.

3.08 CLEANING

A. Immediately remove stains, efflorescence, or other excess resulting from the work of this section.

B. Remove excess mortar, smears, and droppings as work proceeds and upon completion.

C. Clean surrounding surfaces.

D. Repair, restore, or replace to the satisfaction of the Architect, all materials, landscaping, and non-masonry surfaces damaged by exposure to the cleaning process.

END OF SECTION

SECTION 04 0511
MASONRY MORTARING AND GROUTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Mortar for masonry.

B. Grout for masonry.

1.02 RELATED REQUIREMENTS

A. Section 04 0100 - Maintenance of Masonry: Bedding and pointing mortar for masonry restoration work.

B. Section 04 2000 - Unit Masonry: Installation of mortar and grout.

C. Section 04 7200 - Cast Stone Masonry: Installation of mortar.

1.03 REFERENCE STANDARDS

A. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.

B. ASTM C5 - Standard Specification for Quicklime for Structural Purposes; 2024.

C. ASTM C91/C91M - Standard Specification for Masonry Cement; 2018.

D. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2023.

E. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2018.

F. ASTM C150/C150M - Standard Specification for Portland Cement; 2022.

G. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2018.

H. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019a, with Editorial Revision.

I. ASTM C387/C387M - Standard Specification for Packaged, Dry, Combined Materials for Concrete and High Strength Mortar; 2023.

J. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2018.

K. ASTM C476 - Standard Specification for Grout for Masonry; 2019.

L. ASTM C595/C595M - Standard Specification for Blended Hydraulic Cements; 2021.

M. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2020.

N. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2016.

O. ASTM C1019 - Standard Test Method for Sampling and Testing Grout; 2016.

P. ASTM C1072 - Standard Test Method for Measurement of Masonry Flexural Bond Strength; 2013, with Editorial Revision (2014).

Q. ASTM C1148 - Standard Test Method for Measuring the Drying Shrinkage of Masonry Mortar; 1992a (Reapproved 2014).

R. ASTM C1314 - Standard Test Method for Compressive Strength of Masonry Prisms; 2016.

S. ASTM E514/E514M - Standard Test Method for Water Penetration and Leakage Through Masonry; 2020.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Include design mix and indicate whether the Proportion or Property specification of ASTM C270 is to be used.

1. Where a water repellent admixture is specified, submit documentation showing that water repellent admixture is compatible with the water repellent used by the masonry brick/block manufacturer.

C. Samples: Submit two samples of mortar, illustrating mortar color and color range.

D. Reports: Submit reports on mortar indicating compliance of mortar to property requirements of ASTM C270 and test and evaluation reports per ASTM C780.

E. Reports: Submit reports on grout indicating conformance of component grout materials to requirements of ASTM C476and test and evaluation reports to requirements of ASTM C1019 and ASTM C939.

F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

G. Manufacturer's Installation Instructions: Submit packaged dry mortar manufacturer's installation instructions, if packaged dry mortars are used.

1.05 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.
1. Maintain one copy of each document on project site.

1.06 PRECONSTRUCTION TESTING

A. Testing will be conducted by an independent test agency, in accordance with provisions of Section 01 4000 - Quality Requirements.

B. Mortar Mixes: Test mortars prebatched by weight in accordance with ASTM C780 recommendations for preconstruction testing.
1. Test results will be used to establish optimum mortar proportions and establish quality control values for construction testing.

C. Grout Mixes: Test grout batches in accordance with ASTM C1019 procedures.
1. Test results will be used to establish optimum grout proportions and establish quality control values for construction testing.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

1.08 FIELD CONDITIONS

A. Temperature and Humidity
1. During cold weather construction do not lay masonry units unless the temperature is 40 degrees Fahrenheit and rising.
2. During hot weather construction (ambient air temperature exceeds 100 degrees Fahrenheit or 90 degrees Fahrenheit with wind velocity greater than 8 mph) do not spread mortar beds more than 4 feet ahead of masonry and set brick masonry within 1 minute of spreading mortar. Fog spray cure twice daily at four hour intervals for three days during hot weather.
3. Protect masonry construction from direct exposure to wind and sun when erected in ambient air temperature of greater than 99 degrees Fahrenheit in the shade, with relative humidity less than 50 percent.
4. During hot weather protect brick masonry units from sun until units are ready to be placed in the wall.

PART 2 PRODUCTS

2.01 MORTAR AND GROUT APPLICATIONS

A. At Contractor's option, mortar and grout may be field-mixed from packaged dry materials or made from factory premixed dry materials with addition of water only.

B. Mortar Color: To be selected from manufactures standard colors unless specifically scheduled on the drawings.
   1. Where colored mortar is specified it is recommended that factory premixed mortar be used. Mortar color shall be consistent throughout the project with the sample produced and approved on the mock-up wall.

C. Mortar Mix Designs: ASTM C270, Proportion Specification.
   1. Masonry below grade and in contact with earth: Type S.
   2. Exterior Masonry Veneer: Type N.
   3. Exterior, Loadbearing Masonry: Type N.
   4. Exterior, Non-loadbearing Masonry: Type N.
   5. Exterior Repointing Mortar: Type N with maximum 2 percent ammonium stearate or calcium stearate per cement weight.
   6. Interior, Loadbearing Masonry: Type N.
   7. Interior, Non-loadbearing Masonry: Type N.
   8. Pointing Mortar for Prefaced or Specially Faced Unit Masonry: One part Portland cement, 1/8 part hydrated lime, and two parts graded (80 mesh) aggregate, proportioned by volume. Add aluminum tristearate, calcium stearate, or ammonium stearate equal to 2 percent of Portland cement by weight.
   9. Glass Unit Masonry: Type N mortar and Type O pointing mortar.

D. Grout Mix Designs:
   1. Refer to Contract Documents for grout strength and slump requirements. Provide premixed or job mixed grout in acordance with ASTM C94/C94M. It is permitted to provide fine or coarse grout in accordance with the table below:

Grout Type	Maximum Grout Pour Height	Minimum Clear Width of Grout Space	Minimum Clear Grout Space Dimensions for Grouting Cells of Hollow Units
Fine	1'-0" 5'-0" 12'-0" 24'-0"	3/4" 2" 2 1/2" 3"	1 1/2" x 2" 2" x 3" 2 1/2" x 3" 3" x 3"
Coarse	1'-0" 5'-0" 12'-0" 24'-0"	1 1/2" 2" 2 1/2" 3"	1 1/2" x 3" 2 1/2" x 3" 3" x 3" 3" x 4"

   2. Grout shall be poured in maximum lift heights (increment of grout height within a pour height) and maximum grout heights (total height of masonry to be poured prior to the erection of additional masonry) noted below:
      a. Grout in partially grouted walls shall be placed in pour heights equal to the bond beam spacing not to exceed 5'-4". Pour heights are permitted to be increased up to 12'-8" provided the following conditions are met:
         1) The masonry has cured for a minimum of 4 hours.
         2) Grout slump is maintained between 10 in and 11 in.
         3) No intermediate reinforced bond beams are placed between the top and the bottom of the pour height.
      b. Grout in fully grouted walls are permitted to be poured per the maximum pour heights provided in the table above. Lift heights shall not exceed 5'-4" except that it permitted to increase lift heights to 12'-8" provided the following conditions are met:
         1) The masonry has cured for a minimum of 4 hours.
         2) Grout slump is maintained between 10 in and 11 in.

c. Grout in lintel beams shall be placed in lift heights equal to the full depth of the beam unless noted otherwise.

2.02 MATERIALS

A. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C1714/C1714M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
   1. Color: Mineral pigments added as required to produce approved color sample.

B. Packaged Dry Material for Grout for Masonry: Premixed cementitious materials and dried aggregates; capable of producing grout of the specified strength in accordance with ASTM C476 with the addition of water only.

C. Cement:
   1. Type:
      a. Cement: Type I - Normal Portland; ASTM C150/C150M.
      b. Blended Hydraulic Cement: Type IL - Portland-Limestone Cement; ASTM C595/C595M
   2. Color: Color as required to produce approved color sample.

D. Masonry Cement: ASTM C91/C91M.
   1. Type: Type N; ASTM C91/C91M.

E. Hydrated Lime: ASTM C207, Type S.

F. Quicklime: ASTM C5, non-hydraulic type.

G. Mortar Aggregate: ASTM C144.

H. Grout Aggregate: ASTM C404.

I. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.
   1. Pigment: To be selected from manufactures standard colors unless specifically scheduled on the drawings.
   2. Manufacturers:
      a. Quikrete Companies: www.quikrete.com
      b. Amerimix, an Oldcastle brand, Bonsal American: www.amerimix.com
      c. TXI: www.txi.com.
      d. Substitutions: See Section 01 6000 - Product Requirements.

J. Water: Clean and free from deleterious acids, alkalies, and organic matter.

K. Integral Water Repellent Admixture: Polymeric liquid or powder admixture added to mortar at the time of manufacture.
   1. Performance of Mortar with Integral Water Repellent:
      a. Water Permeance: When tested per ASTM E514/E514M and for a minimum of 72 hours:
         1) No water visible on back of wall above flashing at the end of 24 hours.
         2) No flow of water from flashing equal to or greater than 0.032 gallons per hour at the end of 24 hours.
         3) No more than 25 percent of wall area above flashing visibly damp at end of test.
      b. Flexural Bond Strength: ASTM C1072; minimum 10 percent increase.
      c. Compressive Strength: ASTM C1314; maximum 5 percent decrease.
      d. Drying Shrinkage: ASTM C1148; maximum 5 percent increase in shrinkage.
   2. Required only at all single wythe exterior masonry wall applications and in conjunction with hollow brick used on the back of parapet walls.
   3. At single wythe exterior concrete masonry, water repellent admixture shall be compatible with the water repellent used by the masonry unit manufacturer.

2.03 MORTAR MIXING

A. Thoroughly mix mortar ingredients using mechanical batch mixer, in accordance with ASTM C270 and in quantities needed for immediate use.

B. Maintain sand uniformly damp immediately before the mixing process.

C. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio; mix in accordance with manufacturer's instructions, uniform in coloration.

D. No Admixtures are allowed except water repellents where required.

E. Do not use anti-freeze compounds to lower the freezing point of mortar.

F. If water is lost by evaporation, re-temper only within two hours of mixing.

2.04 GROUT MIXING

A. Mix grout in accordance with ASTM C94/C94M.

B. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C476 for fine and coarse grout.

C. No Admixtures are allowed except water repellents where required.

D. Do not use anti-freeze compounds to lower the freezing point of grout.

PART 3 EXECUTION

3.01 PREPARATION

A. Plug clean-out holes for grouted masonry with matching masonry units. Brace masonry to resist wet grout pressure.

3.02 INSTALLATION

A. Contractor shall note that the dimensions shown on the floor plans and plan details are in some instances nominal masonry dimensions. The contractor is responsible for coordinating the masonry layout to provide 3/8” joints. If conflict occurs, contractor shall contact Architect prior to installing masonry.

B. Site Verification of Conditions
   1. Examine the area and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.
   2. Verify that wall ties, and reinforcement are properly located.
   3. Verify that flashings are properly located and intact.

C. Mortar and Grout
   1. Head joints: Regardless of thickness, completely fill with mortar or grout. Do not slush full.
   2. Except at the finishing course, stop grout approximately 1" below the top of the last course.
   3. At the finishing course, bring the last grout pour flush with the top of the brick.
   4. Whenever possible, grout from the inside face of the masonry.
   5. Take extreme care to prevent grout or mortar staining the face of masonry to be left exposed or unpainted.
   6. Protect sills, ledges, offsets, door jambs, corners, and similar points from damage and from collecting mortar or grout.
   7. Immediately remove mortar and grout from areas where they are not scheduled to be placed.
   8. All mortar shall be hard and durable after curing. Scratchable mortar is not acceptable.
   9. Perform grouting in strict accordance with the provisions of the Building Code.
   10. Solidly fill vertical cells containing reinforcement.

11. Consolidate grout at time of pour by puddling with a mechanical vibrator, filling all cells of the masonry, and then reconsolidating later by puddling before the plasticity is lost.

D. Install mortar and grout to requirements of section(s) in which masonry is specified.

E. Work grout into masonry cores and cavities to eliminate voids.

F. Do not install grout in lifts greater than 16 inches without consolidating grout by rodding.

G. Do not displace reinforcement while placing grout.

H. Remove excess mortar from grout spaces.

3.03 FIELD QUALITY CONTROL

A. A Special Inspection and Testing Agency (SITA) will perform field quality control tests and inspections, as specified in Sections 01 4516 and 01 4533.

END OF SECTION

SECTION 04 2000
UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Standard Concrete Masonry Units.
B. Clay facing brick.
C. Calcium Silicate Masonry
D. Reinforcement and anchorage.
E. Flashings.
F. Lintels.
G. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 2000 - Concrete Reinforcing: Reinforcing steel for grouted masonry.
B. Section 04 0100 - Maintenance of Masonry.
C. Section 04 0511 - Masonry Mortaring and Grouting.
D. Section 05 5000 - Metal Fabrications: fabricated steel items.
E. Section 06 1000 - Rough Carpentry: Nailing strips built into masonry.
F. Section 07 2100 - Thermal Insulation: Insulation for cavity spaces.
G. Section 07 2700 - Air and Water Barriers: Air and water-resistive barriers applied to the exterior face of the backing sheathing or masonry.
H. Section 07 6200 - Sheet Metal Flashing and Trim: Metal through-wall masonry flashings.
I. Section 07 8400 - Firestopping: Firestopping at penetrations of fire-rated masonry and at top of fire-rated walls.
J. Section 07 9200 - Joint Sealants: Sealing control and expansion joints.

1.03 REFERENCE STANDARDS

A. ASTM C90 - Standard Specification for Dry-Cast Loadbearing Concrete Masonry Units; 2024a.
B. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale); 2017a.
C. ASTM C1314 - Standard Test Method for Compressive Strength of Masonry Prisms; 2016.
D. BIA Technical Notes No. 13 - Ceramic Glazed Brick Exterior Walls; 2017.
E. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.
F. NCMA TEK 19-7 - Characteristics of Concrete Masonry Units with Integral Water Repellent, 2008
G. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Pre-installation Meetings
   1. Comply with provisions of Section 01 3000 - Administrative Requirements.

2. Not less than one week prior to commencing all masonry related items a pre-installation conference shall be held at the site. Attendance is mandatory for all trades affected by this section. The general contractor shall be responsible for coordinating this conference with all affected trades (Including but not limited to jobsite superintendent, masonry contractor, masonry foreman, waterproofing and flashing contractor, concrete block insulator and architect). The architect will conduct the business of this meeting. All masonry work that takes place prior to this conference shall be marked as rejected and shall be removed, no exceptions.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.

C. Shop Drawings: Indicate pertinent dimensions, materials, anchorage, masonry reinforcement, size and type of fasteners, and accessories for brick/blockwork support system. Shop drawings shall indicate all required mechanical duct openings and all MEP penetrations through CMU/masonry, including opening size, location, and elevation. Shop drawings that do not show required duct openings and penetrations shall be rejected without review and returned as Revise and Resubmit.

D. Samples: Submit four samples of facing brick and architectural masonry units to illustrate color, texture, and extremes of color range. Sample shall be of actual unit specified to be installed.

E. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

1.06 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.
   1. Maintain one copy of each document on project site.

B. At all units (concrete masonry, stone, cast stone or other) for which an integral water repellent was specified to be in the units, perform the Water Droplet Test as recommended in the performance criteria of NCMA TEK 19-7 associated with the Water Droplet Test Method.

C. Certifications
   1. Do not commence placement of masonry until mortar mix designs have been reviewed and approved by the Testing Laboratory and all governmental agencies having jurisdiction and until copies are at the job site.

1.07 MOCK-UP

A. Field Sample (Panels for texture and color approvals only)
   1. In an area on the site where approved by the Architect, provide sample masonry panels.
      a. Make each sample panel approximately 4'-0" high and 6'-0" long.
      b. Provide one sample panel for each combination of masonry units, bond pattern, mortar color, and joint type used in the Work.
      c. For renovation projects, locate panel adjacent to existing building to allow side by side viewing of both existing building and panel. Panel shall be located in an area that receives both direct sun and shade.
      d. Revise as necessary to secure approval from Owner and Architect.
      e. Completely demolish and remove from the job site upon completion and acceptance of the work.

B. Mock-Ups (Wall for quality control purposes)
   1. A mock-up wall shall be constructed only after the pre-installation conference.

2. The Architect shall select a section of exterior wall within the building that shall be used for a wall mock-up to determine quality of workmanship for the entire project. The mock-up shall consist of approximately 50 lineal feet of exterior wall and shall include straight wall, corners, control and expansion joints, window installation, anchors and reinforcing, and flashings. This mock-up shall incorporate all aspects of the accepted masonry sample panel as well including proper cleaning techniques. Cleaning agent manufacturer's representative shall be on site to observe and instruct the cleaning portion.
3. Installation of all materials and products into the wall shall be in accordance with all applicable specifications as noted in the project manual and as shown on the drawings.
4. Upon completion and acceptance of the wall mock-up and quality of workmanship, the wall shall be photographically documented by the Contractor as a record. Provide one copy of photos to each the Owner, the Architect and the Contractor. The wall shall then be incorporated into the project and shall be the standard for all masonry work on the project.
5. No work shall proceed until the mock-up wall is approved.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

B. All masonry products stored on site shall be properly covered from the weather to prevent deterioration and moisture penetration. Broken or damaged masonry products shall be rejected. Do not double-stack pallets.

C. Storage and protection of masonry embedded flashing;
1. Comply with manufacturer's recommendations for storage and handling of each product.
2. Wall Flashing and Surface Conditioner shall be delivered in the original, unopened manufacturer's containers with all labeling information fully visible.
3. On-Site Storage of unopened cartons shall be such that the material is kept dry and is not stored at temperatures in excess of 100 deg. F. Pallets of cartons should not be double stacked for on-site storage.
4. Surface Conditioner is non-flammable. Refer to product label before use.

D. Acceptance at Site
1. Deliver materials in manufacturer's unopened containers, fully identified with name, brand, type, and grade.
2. Materials with missing or illegible identification shall be rejected.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

A. Manufacturers:
1. Best Block Construction Materials: www.bestblock.com.
2. Boral Concrete Products: www.boralconcreteproducts.com
3. Oldcastle Architectural, Jewell Concrete Products: www.jewellcp.com.
4. Spectra Development Corporation: www.spectraglaze.com.
5. Texas Building Products, Inc.: www.texasbuildingproducts.com.
6. Trenwyth Industries, Inc.: www.echelonmasonry.com.
7. Substitutions: See Section 01 6000 - Product Requirements.

B. Standard Concrete Masonry Units: Comply with referenced standards and as follows:
1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.
2. Special Shapes: Provide non-standard blocks configured for corners, lintels, headers, control joint edges, and other detailed conditions.
3. Use bullnose type concrete masonry units at all edges and exterior corners.
4. Load Bearing/Non-Load Bearing Units: ASTM C90, lightweight.

5. Load-Bearing Units/ Non-Loadbearing Units: ASTM C90, normal weight
    a. Provide at all sound wall locations unless noted otherwise.
6. 4" wide units shall be provided as hollow cell units.

2.02 BRICK UNITS

A. Manufacturers:
1. Acme Brick Company: www.brick.com
2. Elgin Butler Company: www.elginbutler.com.
3. Endicott Clay Products Co: www.endicott.com.
4. General Shale Brick: www.generalshale.com.
5. Meridian Brick LLC : www.meridianbrick.com/#sle.
6. Interstate Brick: www.interstatebrick.com
7. Sioux City Brick: www.siouxcitybrick.com
8. Summit Brick: www.summitbrick.com
9. Kansas Brick and Tile/Cloud Ceramics: www.kansasbrick.com
10. Substitutions: See section 01 6000 - Product Requirements.

B. Facing Brick: ASTM C216, Type FBS Smooth, Grade SW.
1. Color and texture: Refer to Schedule of Materials and Colors on the drawings.
2. Nominal size: Slim Utility. See drawings
3. Special shapes: Provide special shapes at all intersections not equal to 90 degrees to conform to the brick selected or of the same type and finish in the brick allowance. Where solid brick are noted on the plans, provide brick of appropriate size without cores.
4. Compressive strength: As measured in accordance with ASTM C67.

C. Thin Brick Veneer: ASTM C 1088, Type TBS, tested in accordance with ASTM C 67
1. Thickness: 1"
2. Nominal face size: Utility with smooth backs.
3. Color and texture: Refer to Schedule of Materials and Colors on the drawings.
4. Special shapes: Provide special shapes at all intersections not equal to 90 degrees to conform to the brick selected.
5. Thin-Set Bonding Mortar
    a. Polymer fortified, thin-set mortar for interior installation of thin brick
    b. Meet or exceed ANSI A118.4 Shear Bond Strength Requirements & ANSI A118.11.
    c. Basis of Design: Laitcrete MVIS Veneer Mortar
6. Water Crack Isolation Membrane:
    a. Single component, load bearing, fluid applied, bulk water managment and crack isolation membrane.
    b. Meet or exceed ANSI A118.12.
    c. Basis of Design: Laitcrete MVIS WCI Water Crack Isolation membrane.
7. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or ASTM C 1325, with manufacturer’s standard edges.
    a. Thickness: ½ inch.
    b. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.03 CALCIUM SILICATE MASONRY UNITS

A. Manufacturers:
1. Arriscraft International Inc,; www.arriscraft.com.
2. Substitutions: See Section 01 6000 - Product Requirements.

B. Calcium Silicate Masonry Units: ASTM C73, Grade SW; solid units having been pressure formed and autoclaved; 3-5/8" bed depth; modular sizes as indicated on drawings; sandblasted or rocked finish as scheduled on exposed faces and ends; special shapes as indicated; and having the following typical average properties when tested to the identified standard.

1. Compressive Strength: 6815 psi, to ASTM C170.
2. Absorption: 10.3 percent, to ASTM C97.
3. Density: 120 lbs/ft3, to ASTM C97.
4. Modulus of Rupture: 800 psi, to ASTM C99.
5. Color and size: Refer to Schedule of Materials and Colors on the drawings.
6. Acceptable Product: Arriscraft – Renaissance Masonry.

C. Fabricate calcium silicate masonry units to the following tolerances.
1. Unit Length: plus or minus 1/16".
2. Unit Height: plus or minus 1/16".
3. Deviation from Square: plus or minus 1/16", with measurement taken using the longest edge as the base.
4. Bed Depth: plus or minus 1/8".
5. Custom Dimensions: plus or minus 1/8".
6. Unit Face Deviations: plus or minus 3/8”.

D. Mascot Engraving: Mascot engraving and shading to be completed on site post material installation. Subcontractor shall price shading material on engraving, Owner and Architect to review at submittal.
1. Tommy Schlitzberger
Schlitzberger Stone Designs
6343 Alder Dr., Houston, Texas 77081.
C: 713-545-6897
T: 713-987-0375
https://www.stonedesignsinc.com
2. Christine Lee
Stone Creations of Texas
15734 Farm To Market 2920Tomball, TX 77377.
P: 281-541-5276
http://Stonecreationsoftexas.com

2.04 MORTAR AND GROUT MATERIALS

A. Mortar and Grout: As specified in Section 04 0511.

2.05 REINFORCEMENT AND ANCHORAGE

A. Manufacturers:
1. Blok-Lok Limited: www.blok-lok.com/#sle.
2. Hohmann & Barnard, Inc: www.h-b.com/sle.
3. PROSOCO, Inc: www.prosoco.com.
4. WIRE-BONDwww.wirebond.com/#sle.
5. Substitutions: See Section 01 6000 - Product Requirements.

B. In addition to all other specification requirements, veneer anchors shall be designed by a professional engineer licensed in Texas, hired by the Contractor, where the horizontal distance is greater than 4 1/2 inches between the inside face of the masonry veneer (e.g. brick, concrete masonry, cast stone, etc...) and the outside face of the structural backup system (e.g. CMU, face of cold formed metal framing members, etc...).

C. Reinforcing Steel: Type specified in Section 03 2000; size as indicated on drawings; uncoated finish.

D. Wire reinforcement: Reinforced hot dip galvanized wall reinforcing in conformance with ASTM A951, for high tensile steel. hot-dipped galvanized to comply with ASTM A153, Class BMill-galvanized wire reinforcement shall not be permitted on any part of the project. 9 gage wire, deformed to develop minimum surface bond of 527 PSI when cast in ASTM Class A mortar cubes. Provide rod spacings and veneer anchor dimensions to locate rods and veneer anchors in mortar to comply with the requirements of the applicable version of the Masonry Standards Joint Committee document TMS 402, referring to the construction drawings for dimensions of wythe thicknesses and dimensions between wythes.

E. Veneer anchor wires: Reinforced hot dip galvanized wire in conformance with ASTM A951, for high tensile steel, hot-dipped galvanized to comply with ASTM A153, Class B. Mill-galvanized wire reinforcement shall not be permitted on any part of the project. 9 gage wire. Provide rod spacings and veneer anchor dimensions to locate rods and veneer anchors in mortar to comply with the requirements of the applicable version of the Masonry Standards Joint Committee document TMS 402, referring to the construction drawings for dimensions of wythe thicknesses and dimensions between wythes.

F. Horizontal Bedjoint Reinforcement in Concrete Masonry, and Masonry Veneer Anchors with Concrete Masonry Backup Systems: Install bedjoint reinforcement at 16" on center in all concrete masonry walls, excluding masonry veneer wythes unless they are laid at the same time as backup masonry. Horizontal bedjoint reinforcement, as well as deformed rebar, shall continue through all crack control joints in all concrete masonry walls (both load-bearing and non-load-bearing, both interior and exterior).
    1. Single-wythe concrete masonry walls without masonry veneer: Ladder Type, using #220 Ladder-Mesh as manufactured by Hohmann & Barnard, Inc or equal.
    2. Single-wythe concrete masonry backup with masonry veneer laid after backup wythe: Install one of the following two options:
        a. Provide bedjoint reinforcement with eyelets flush-welded, so as to avoid wire buildup of wire laminations, and adjustable double-pintle-leg anchors at 16" on center along the bedjoint reinforcement, using Adjustable Truss Lox-All Adjustable Eye-Wire with TRU-JOINT as manufactured by Hohmann & Barnard, Inc or equal, or
        b. Provide bedjoint reinforcement without eyes, as noted above for Single-wythe concrete masonry walls without masonry veneer, and in alternating bedjoints with bedjoint reinforcement so as to avoid wire buildup of wire laminations, provide Adjustable Wall Ties (Pintles and Eyes) as manufactured by Hohmann & Barnard, Inc or equal, at 16" on center each way.
    3. Multiple-wythe concrete masonry walls, excluding masonry veneer wythes: Composite Truss Type with two rods in each wythe, using #140 Truss Twin-Mesh as manufactured by Hohmann & Barnard, Inc or equal. At walls with more than two structural wythes, alternate pairs of wythes being tied together at 8" on center so that each pair of wythes is being tied together at 16" on center.
        a. To anchor masonry veneer to multiple-wythe concrete masonry backup systems: Install Adjustable Wall Ties (Pintles & Eyes) as manufactured by Hohmann & Barnard, Inc or equal at 16" on center each way.

G. Masonry Veneer Anchors with Cast-in-place Concrete Backup Systems:
    1. At concrete backup systems with temporary forms that are removed, one of the following options shall be installed:
        a. Before concrete is poured, mount 22 ga hot-dip galvanized dovetail channels to receive dovetail veneer anchors, using #305 Dovetail Slot as manufactured by by Hohmann & Barnard, Inc or equal. After concrete is poured and temporary forms are removed, install 12 ga hot-dip galvanized dovetail anchors with vee wall ties at 16" on center each way, using #315 Flexible Dovetail Brick Tie as manufactured by Hohmann & Barnard, In., or equal.

b. If dovetail channels are not installed as noted above, the Contractor shall be permitted to install a two-piece concrete anchored adjustable wire tie system at 16" on center each way, using HB-5213 Adjustable Veneer Anchor as manufactured by Hohmann & Barnard, Inc. or equal with concrete screws as recommended by the manufacturer.

H. Masonry Veneer Anchors with Stud Backup Systems: Install a two piece anchored adjustable wire tie system at 16" on center each way, with screws as recommended by the manufacturer and as required by the applicable version of TMS 402.
   1. Exterior stud walls with masonry veneer:
      a. HB-213X Adjustable Veneer Anchor as manufactured by Hohmann & Barnard, Inc.
      b. Substitutions: See Section 01 6000 - Product Requirements.
   2. Interior stud walls with masonry veneer:
      a. DW-10 Wall Ties as manufactured by Hohmann & Barnard, Inc.
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.06 FLASHINGS

A. Through Wall Flashing Materials: Products as specified in Sections 07 2700 and 07 6200.

2.07 ACCESSORIES

A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.
   1. Manufacturers:
      a. Blok-Lok Limited: www.blok-lok.com.
      b. Hohmann & Barnard, Inc: www.h-b.com/sle.
      c. WIRE-BOND: www.wirebond.com/#sle.
      d. Substitutions: See Section 01 6000 - Product Requirements.

B. Joint Filler: Closed cell polyethylene; oversized 50 percent to joint width; self expanding; 1/2 inch wide by maximum lengths available.
   1. Manufacturers:
      a. Hohmann & Barnard, Inc: www.h-b.com/sle.
      b. WIRE-BOND: www.wirebond.com/#sle.
      c. Substitutions: See Section 01 6000 - Product Requirements.

C. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.
   1. Mortar Diverter: Semi-rigid mesh designed for installation at flashing locations.
      a. Manufacturers:
         1) CavClear Inc., CavClear Masonry Mat MDCD, www.CavClear.com.
         2) Hohmann & Barnard, Inc; Mortar Trap: www.h-b.com/sle.
         3) Mortar Net Solutions; MortarNet: www.mortarnet.com/#sle.
         4) Substitutions: See Section 01 6000 - Product Requirements.

D. Nailing Strips: Softwood lumber, preservative treated; as specified in Section 06 1000.

E. Weeps:
   1. Type: Molded PVC grilles, insect resistant.

F. Cavity Vents:
   1. Type: Molded PVC grilles, insect resistant.

G. Bond Break Material - Provide one layer of 6 mil polyethylene equal to “Visqueen Vapour Barrier” as a bond breaker between all clay masonry and CMU in the same wythe. Rake joint back 3/8” and provide continuous sealant at joint.

2.08 LINTELS

A. All concrete masonry lintels, not including 4" nominal concrete masonry veneer lintels, shall be reinforced concrete masonry lintels as specified on the Structural Drawing Sheets unless steel beam supports are shown on the Structural Drawings. Where steel beam supports are shown, the concrete masonry shall be bonded to the top of the steel beam with 1/2" diameter Nelson D2Lbars x 24" long at 16" on center.

B. All exterior masonry veneer supports over openings shall be as shown on the Structural Drawings.

C. For interior masonry veneers with an air space between the veneer and backup, Interior masonry veneer supports over openings shall be the same as for exterior veneer supports, as shown on the Structural Drawings.

D. For interior masonry veneer with a mortar-filled collar joint shown on the Drawings, interior masonry veneer supports shall be loose steel lintels as scheduled on the Structural Drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Contractor shall note that the dimensions shown on the floor plans and plan details are nominal masonry dimensions. The contractor is responsible for coordinating the masonry layout to provide 3/8” joints. If conflict occurs, contractor shall contact Architect prior to installing masonry.

B. Verify that field conditions are acceptable and are ready to receive masonry.

C. Verify that related items provided under other sections are properly sized and located.

D. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 PREPARATION

A. Direct and coordinate placement of metal anchors supplied for installation under other sections.

B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

C. Surface Preparation for Masonry Units
   1. Do not commence installation until foundations are clean, rough, and level.
   2. Remove all laitance and foreign material from top of foundation.
   3. Verify that the foundation elevation is such that the bed joint thickness will be between 3/8" and 1/2", and that the foundation edge is true to line.
   4. Clean projecting dowels free from loose scale, dirt, concrete, and other material that will inhibit bond.
   5. Verify that dowels are in proper location.

D. Surface Preparation for Rubberized Asphalt Flashing
   1. Apply primer by brush or heavy nap, natural-material roller at rate recommended by manufacturer prior to flashing installation. Allow primer to dry completely before flashing application.

E. Collection System and Weeps
   1. Clean flashing and weep holes so they are free of mortar droppings and debris immediately prior to installing collection system or weep.
   2. Remove projecting mortar and other protrusions from substrate.
   3. Remove mortar and debris from cavity spaces, wall ties, and reinforcing.

3.03 COLD AND HOT WEATHER REQUIREMENTS

A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

B. Masonry Cold Weather Construction:
   1. When ambient air temperature is below 40°F, cold weather procedures shall be implemented.
   2. Preparation: Comply with the following requirements prior to conducting masonry work:
      a. Masonry units shall not be laid when unit temperature is below 20°F, or when units contain frozen moisture, visible ice, or snow on their surface.
      b. Visible ice and snow shall be removed from the top surface of existing foundations and masonry that will receive new construction. These surfaces shall be heated above freezing using methods that do not result in damage.
   3. Construction: These requirements apply to work in progress and are based on ambient air temperature. Do not heat water or aggregates used in mortar or grout above 140°F. Comply with the following requirements when the following ambient air temperatures exist:
      a. 40°F to 32°F:
         1) Heat sand or mixing water to produce mortar temperature between 40°F and 120°F at the time of mixing.
         2) Heat grout materials when the temperature of the materials is below 32°F.
      b. Below 32°F to 25°F:
         1) Heat sand and mixing water to produce mortar temperature between 40°F and 120°F at the time of mixing. Maintain mortar temperature above freezing until used in masonry.
         2) Heat grout aggregates and mixing water to produce grout temperature between 70°F and 120°F at the time of mixing. Maintain grout temperature above 70°F at the time of grout placement.
      c. Below 25°F to 20°F: Meet all requirements listed under Below 32°F to 25°F, and comply with the following:
         1) Heat masonry surfaces under construction to a minimum temperature of 40°F.
         2) Wind breaks or enclosures shall be used when wind velocity exceeds 15 mph.
         3) Heat masonry to a minimum temperature of 40°F prior to grouting.
      d. Below 20°F: Meet all requirements listed under Below 25°F to 20°F, and comply with the following:
         1) An enclosure and auxiliary heat shall be provided to maintain air temperature above 32°F within the enclosure.
   4. Protection: These requirements shall apply after masonry is placed and are based on anticipated minimum daily temperature for grouted masonry and anticipated mean daily temperature for ungrouted masonry. Protect completed masonry in the following manner:
      a. 40°F to 25°F: Protect newly constructed masonry by covering with a weather-resistive membrane for 24 hr after being completed.
      b. Below 25°F to 20°F: Cover newly constructed masonry completely with weather-resistive insulating blankets, or equal protection, for 24 hr after completion of work. Extend the time period to 48 hr for grouted masonry, unless the only cement in the grout is Type III portland cement.
      c. Below 20°F: Maintain newly constructed masonry temperature above 32°F for at least 24 hr after being completed by using heated enclosures, electric heating blankets, infrared lamps, or other acceptable methods. Extend the time period to 48 hr for grouted masonry, unless the only cement in the grout is Type III portland cement.

C. Hot weather Construction:
   1. Preparation: Prior to conducting masonry work:
      a. When the ambient air temperature exceeds 100°F, or exceeds 90°F with a wind velocity greater than 8 mph:
         1) Maintain sand piles in a damp, loose condition.
         2) Provide necessary conditions and equipment to produce mortar having a temperature below 120°F.

3) Fog spray or wet scratch coats until damp prior to installation of adhered veneer.

b. When the ambient temperature exceeds 115°F, or exceeds 105°F with a wind velocity greater than 8 mph, meet all requirements listed under Section a above, and shade materials and mixing equipment from direct sunlight.

2. Construction: While masonry work is in progress:
   a. When the ambient air temperature exceeds 100°F, or exceeds 90°F with a wind velocity greater than 8 mph:
      1) Maintain temperature of mortar and grout below 120°F.
      2) Flush mixer, mortar transport container, and mortar boards with cool water before they come into contact with mortar ingredients or mortar.
      3) Maintain mortar consistency by retempering with cool water.
      4) Use mortar within 2 hr of initial mixing.
   b. When the ambient temperature exceeds 115°F, or exceeds 105°F with a wind velocity greater than 8 mph, meet all requirements listed under Section a above and use cool mixing water for mortar and grout. Ice is permitted in the mixing water prior to use. Do not permit ice in the mixing water when added to the other mortar or grout materials.
3. Protection: When the mean daily temperature exceeds 100°F or exceeds 90°F with a wind velocity greater than 8 mph, fog spray newly constructed masonry until damp, at least three times a day until the masonry is three days old.

3.04 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Bed joints in masonry units shall course out with bed joints in adjacent masonry wythes at vertical intervals of 16”.

D. Cut out and repoint defective joints.

E. On all joints exposed to the weather, tool and make smooth, solid, and watertight.

F. All joints shall be thumbprint hard prior to tooling.

G. Use 18” sled on bed joints, brush wall, and retool joints.

H. Concrete Masonry Units:
   1. Bond: Running.
   2. Coursing: One unit and one mortar joint to equal 8 inches.
   3. Mortar Joints: Concave at conditions exposed to view. Strike joints flush where a fluid applied weather barrier will be installed as specified in Section 07 2700 - Air and Water Barriers.
   4. Align vertical cells of hollow units to maintain a clear and unobstructed system of flues.

I. Brick Units:
   1. Bond: 1/3rd Running.
   2. Coursing: Three units and three mortar joints to equal 8 inches.
   3. Mortar Joints: Concave.

3.05 PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

B. Lay hollow masonry units with face shell bedding on head and bed joints.

C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

D. Remove excess mortar and mortar smears as work progresses.

E. Remove excess mortar with water repellent admixture promptly. Do not use acids, sandblasting or high pressure cleaning methods.

F. Interlock intersections and external corners, except for units laid in stack bond.

G. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

H. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

I. Cut mortar joints flush where wall tile is scheduled or resilient base is scheduled.

J. Isolate masonry partitions from vertical structural framing members with a control joint as indicated.

K. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

L. Brick and CMU wythes shall be laid in a true and straight alignment. Exterior masonry shall be laid-up separately.

M. Unless otherwise indicated on the Drawings, install masonry plumb, level, and true to line, with square angles and corners. Do not commence installation of the work until horizontal and vertical alignment of the foundation is within 1” plumb and the lines shown on the Drawings.

N. Use line blocks whenever possible. When it is absolutely necessary to use a line pin, fill the hole immediately after the pin is withdrawn.

O. Use only masonry that are clean and free from dust and other foreign matter and lay only dry masonry units.

P. Do not use bonding headers on grouted masonry unless specifically so directed by the Architect.

Q. Masonry with cracks and or chipped faces will be rejected if non-compliant with the limits noted in ASTM C216. If such units are discovered in the finished wall, the Contractor shall remove the units and replace with new units at no cost to the Owner.

R. Lay only dry concrete masonry units.

S. Accurately fit the units to plumbing, ducts, openings, and other interfaces, neatly patching all holes.

T. Keep the walls continually clean, preventing grout and mortar stains. If grout does run over, clean immediately.

U. Bed joints: A complete mortar-to-unit bond is required on all masonry.
   1. Avoid fins of bed joints protruding into grout space or cavity.
      a. If they occur, leave in place if not projecting more than the bed joint thickness.
      b. Do not, in any case, cut off and drop into the grout space or cavity.

V. Head joints: Regardless of thickness, completely fill with mortar or grout. Do not slush full.

W. Lay both Wythes of the wall to a line.

X. Provide reinforcement as shown on the drawings, fully embedded in grout and not in mortar or mortar joints. Provide required metal accessories to insure adequate alignment of steel during grout filling operations.

Y. At locations where items are mounted on/against split face CMU (i.e. door/window jambs, fire extinguisher cabinets, electric water coolers, etc.), grind split face CMU to allow flush, level installation.

3.06 WEEPS/CAVITY VENTS

A. Place weep vents in head joints at exterior wythe of cavity wall located immediately above all flashings, ledges, heads of lintels, sills, and low roof to high wall conditions spaced 24 inches on center for clay and stone masonry units and 32 inches on center for concrete masonry units, unless otherwise shown. Leave the side of the masonry units clear from mortar (unbuttered) forming the vent space.
   1. Place the vent material into joint, directly on top of flashing material, prior to installing the second masonry unit.
   2. Install the weep vents as the wall is being erected so joints do not become filled with mortar or debris.
   3. Install a minimum of two weeps above each exterior door/window.

B. Install cavity vents in veneer and cavity walls at 24 or 32 inches on center horizontally near top of walls.

3.07 CAVITY MORTAR CONTROL

A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

B. For cavity walls, build inner wythe ahead of outer wythe to accommodate accessories.

C. Install 1 continuous row at base of wall and over all wall openings directly on flashing. To prevent mortar bridging between the outer wythe and inner wall, install flashing extending from the bottom of the collection system to at least 6" above the top of the collection system.

D. Install with the offset edge pointing up the wall.

E. Lay the first 1 or 2 courses of masonry at flashing level, then install the collection system continuously by placing it against the inside of the openings. No fasteners or adhesives are required.

F. Compress the collection system horizontally so it can be forced into cavities slightly smaller than its nominal thickness without affecting performance. When forcing the collection system into a cavity, be sure mortar has set sufficiently to resist outward pressure from product.

3.08 REINFORCEMENT AND ANCHORAGE - GENERAL, SINGLE WYTHE MASONRY, AND CAVITY WALL MASONRY

A. Refer to the Structural and Architectural Drawings for reinforcement required in masonry.

B. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.

C. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

D. Place continuous joint reinforcement in first and second joint below top of walls.

E. Lap joint reinforcement ends minimum 6 inches.

F. Do not install masonry anchors at locations where fasteners will penetrate through wall flashing.

G. Do not use reinforcement having any of the following defects.
   1. Bar lengths, depths, or bends exceeding the specified tolerances.
   2. Bends or kinks not indicated on the Drawings or required for the Work.
   3. Bars with cross-section reduced due to excessive rust or other causes.

H. Masonry Tie Installation: Set wall plate in full bed of compatible sealant over substrate. Install fasteners to engage structural framing/masonry, ensuring fasteners are installed snug and straight. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 16 inches horizontally and 16 inches vertically.

3.09 MASONRY FLASHINGS

A. Coordinate masonry work with installation of metal and membrane through wall flashings in accordance with Sections 07 2700 and 07 6200.

B. Laying Masonry Walls at Flashings:
   1. Provide a solid surface at flashing areas using inverted lintels, solid or filled masonry units. Flash at all breaks in wall face where cells are not grouted.
   2. At wall base flashings, place mortar bed on top of flashing.

3.10 GROUTED COMPONENTS

A. Fill one cell of CMU with grout and 1 - #5 bar vertical at each window and door jamb in CMU walls, from floor level to top of wall.

B. Fill 3 cells of CMU with grout and 1 - #5 bar vertical in each cell at all exterior corners of CMU walls, fill full height of wall and extend #5 bar into bond beam a minimum of 6” then bend 90° and extend a minimum of 6”.

C. See drawings for other areas of grout fill required in CMU.

D. Where the collar joint is to be grouted between the wythes of masonry, provide expanded metal or mortar/grout screen at the beginning of the grout.

E. All vertical bars shall be dowelled to the foundations with same size reinforcing bar.

F. Lap splices minimum 48 bar diameters.

G. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.

H. Place and consolidate grout fill without displacing reinforcing.

I. At bearing locations, fill masonry cores with grout for a minimum 8 inches either side of opening.

3.11 CONTROL AND EXPANSION JOINTS

A. Locate 3/8” wide expansion and control joints as indicated on the drawings. However in no case shall they exceed 20’-0” in distance. Contractor shall ensure that joints occur at intervals no more than as noted above and notify the Architect for coordination of placement if additional joints are required. Keep vertical joints straight, true and continuous from top to bottom of masonry.
   1. Expansion joints shall be completely free of mortar and the joint reinforcement shall not continue across the expansion joint. Keep vertical joints straight, true and continuous from top to bottom of masonry. Detail joint as shown on the drawings
   2. At control joints horizontal reinforcing shall run continuous through joint. Detail joint as shown on the drawings.

B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

C. Form expansion joint as detailed on drawings.

3.12 BUILT-IN WORK

A. As work progresses, install built-in metal door frames and glazed frames and other items to be built into the work and furnished under other sections.

B. Install built-in items plumb, level, and true to line.

C. Bed anchors of metal door frames in adjacent mortar joints. Fill frame voids solid with grout.
   1. Fill adjacent masonry cores with grout minimum 8 inches from framed openings.

D. Do not build into masonry construction organic materials that are subject to deterioration.

3.13 TOLERANCES

A. Maximum Variation from Alignment of Columns: 1/4 inch.

B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.

C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.

D. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.

F. Maximum Variation of Joint Thickness: 1/8 inch in 3 ft.

G. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.14 CUTTING AND FITTING

A. Cut and fit for chases, pipes, conduit, sleeves, and grounds. Coordinate with other sections of work to provide correct size, shape, and location.

B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.15 FIELD QUALITY CONTROL

A. A Special Inspection and Testing Agency (SITA) will perform field quality control tests and inspections, as specified in Sections 01 4516 and 01 4533.

3.16 CLEANING

A. Remove excess mortar and mortar droppings.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

D. Use non-metallic tools in cleaning operations.

3.17 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

B. The masonry walls shall be covered at the end of each workday and when work is not in progress. The walls shall be covered with heavy plastic sheeting or water repellent tarps and shall extend a minimum of 2’-0” down each side of the wall and be securely held in place.

END OF SECTION

SECTION 04 7200
CAST STONE MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Architectural cast stone.

1.02 RELATED REQUIREMENTS

A. Section 04 0511 - Masonry Mortaring and Grouting: Mortar for setting cast stone.

B. Section 04 2000 - Unit Masonry: Installation of cast stone in conjunction with masonry.

1.03 REFERENCE STANDARDS

A. ACI 318 - Building Code Requirements for Structural Concrete; 2019 (Reapproved 2022).

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

C. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2022.

D. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 2019.

E. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement; 2014.

F. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2017.

G. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2018.

H. ASTM C150/C150M - Standard Specification for Portland Cement; 2022.

I. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019a, with Editorial Revision.

J. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2019, with Editorial Revision (2022).

K. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2016.

L. ASTM C1364 - Standard Specification for Architectural Cast Stone; 2017.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Test results of cast stone components made previously by the manufacturer.
   1. Include one copy of ASTM C1364 for Architect's use.

C. Shop Drawings: Include elevations, dimensions, layouts, profiles, cross sections, reinforcement, exposed faces, arrangement of joints, anchoring methods, anchors, and piece numbers.
   1. Cast stone and anchors shall be designed and stamped by a professional engineer in the State of Texas.
   2. Shop drawing sheets that include engineering information designed by the Contractor’s Delegated Design Engineer shall be signed and sealed in accordance with the Texas Engineering Practice Act. Sheets that do not provide information designed by the Contractor’s Engineer do not require being signed and sealed. Calculation packages require a signed and sealed cover sheet only. Any submittals requiring to be signed and sealed that are received without the signature and seal will be rejected without review.

D. Mortar Color Selection Samples.

E. Verification Samples: Pieces of actual cast stone components not less than 12 inches square, illustrating range of color and texture to be anticipated in components furnished for the project.

F. Full-Size Samples, For Review:
   1. Basic Shapes: One of each.
   2. Accent, Trim and Specialty Shapes: One of each.

G. Source Quality Control Test Reports.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. A firm with a minimum of 5 years experience producing cast stone of types required for project.
   2. Current producer member of the Cast Stone Institute or the Architectural Precast Association.
   3. Manufacturer's production facility currently holds a Plant Certification from the Cast Stone Institute or the Architectural Precast Association.
   4. Adequate plant capacity to furnish quality, sizes, and quantity of cast stone required without delaying progress of the work.

1.06 MOCK-UP

A. Provide full size cast stone components for installation in mock-up of exterior wall.

B. See Section 01 4000 - Quality Requirements for additional requirements.
   1. Approved mock-up will become standard for appearance and workmanship.
   2. Mock-up may remain as part of the completed work.
   3. Remove mock-up not incorporated into the work and dispose of debris.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver cast stone components secured to shipping pallets and protected from damage and discoloration. Protect corners from damage.

B. Number each piece individually to match shop drawings and schedule.

C. Store cast stone components and installation materials in accordance with manufacturer's instructions.

D. Store cast stone components on pallets with nonstaining, waterproof covers. Ventilate under covers to prevent condensation. Prevent contact with dirt.

E. Protect cast stone components during handling and installation to prevent chipping, cracking, or other damage.

F. Store mortar materials where contamination can be avoided.

G. Schedule and coordinate production and delivery of cast stone components with unit masonry work to optimize on-site inventory and to avoid delaying the work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Architectural Cast Stone:
   1. Any current producer member of the Architectural Precast Association.
   2. Any current producer member of the Cast Stone Institute.

2.02 ARCHITECTURAL CAST STONE

A. Cast Stone: Architectural concrete product manufactured to simulate appearance of natural stone, complying with ASTM C1364.
   1. Compressive Strength: As specified in ASTM C1364; calculate strength of pieces to be field cut at 80 percent of uncut piece.

2. Freeze-Thaw Resistance: Demonstrated by laboratory testing in accordance with ASTM C1364.
3. Surface Texture: Fine grained texture, with no bugholes, air voids, or other surface blemishes visible from distance of 20 feet.
4. Cast Stone Color: Reference Section 01 6210 – Schedule of Materials and Colors.
5. Color Variation:
   a. Viewing Conditions: Compare in direct daylight at 10 feet, between components of similar age, subjected to comparable weathering conditions.
   b. Maximum Variation, ASTM D 2244:
      1) Hue: 2 units.
      2) Lightness, Chroma, and Hue Combined: 6 units.
6. Cure units in a warm, moist curing chamber at 95% relative humidity in totally enclosed curing room under dense fog and water-spray for 24 hours.
7. Remove cement film from exposed surfaces before packaging for shipment.

B. Shapes: Provide shapes indicated on drawings.
   1. Variation from Any Dimension, Including Bow, Camber, and Twist: Maximum of plus/minus 1/8 inch or length divided by 360, whichever is greater, but not more than 1/4 inch.
   2. Unless otherwise indicated on drawings, provide:
      a. Wash or slope of 1:12 on exterior horizontal surfaces.
      b. Drips on projecting components, wherever possible.
      c. Raised fillets at back of sills and at ends to be built in.

C. Inset Letters:
   1. Refer to plans for copy.
   2. Paint all inset letters flat black.

D. Reinforcement: Provide reinforcement as required to withstand handling and structural stresses; comply with ACI 318.
   1. Pieces More than 24 inches in Any Dimension: Provide full length two-way reinforcement of cross-sectional area not less than 0.25 percent of unit cross-sectional area.

2.03 MATERIALS

A. Portland Cement: ASTM C150/C150M.
   1. For Units: Type I, white or gray as required to match Architect 's sample.
   2. For Mortar: Type I or II, except Type III may be used in cold weather.

B. Coarse Aggregate: ASTM C33/C33M, except for gradation; granite, quartz, or limestone.

C. Fine Aggregate: ASTM C33/C33M, except for gradation; natural or manufactured sands.

D. Pigments: ASTM C979, inorganic iron oxides; do not use carbon black.

E. Admixtures: ASTM C494/C494M.
   1. All units shall contain a manufacturer approved integral water repellent admixture at the time of manufacture.

F. Water: Potable.

G. Reinforcing Bars: ASTM A615/A615M deformed bars, galvanized.
   1. Galvanized in accordance with ASTM A767/A767M, Class I.

H. Steel Welded Wire Reinforcement: ASTM A1064/A1064M, galvanized or ASTM A884/A884M, epoxy coated.

I. Embedded Anchors, Dowels, and Inserts: ASTM A 123/A 123M hot-dip galvanized steel, of type and size as required for conditions.

J. Shelf Angles and Similar Structural Items: Hot-dip galvanized steel per ASTM A123/A123M, of shapes and sizes as required for conditions.

K. Mortar: Portland cement-lime, as specified in Section 04 0511 ; do not use masonry cement.

L. Sealer: Provide a weather/graffiti protectant to interior and exterior cast stone units as specified in Section 07 1900 - Water Repellents

M. Cleaner: General-purpose cleaner designed for removing mortar and grout stains, efflorescence, and other construction stains from new masonry surfaces without discoloring or damaging masonry surfaces; approved for intended use by cast stone manufacturer and by cleaner manufacturer for use on cast stone and adjacent masonry materials.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine construction to receive cast stone components. Notify Architect if construction is not acceptable.

B. Do not begin installation until unacceptable conditions have been corrected.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cast stone components in conjunction with masonry, complying with requirements of Section 04 2000.

C. Surface Preparation
1. Clean substrates.
2. Wet down or wash dry, dusty surfaces and remove excess water immediately prior to application of cast stone.
3. Prepare surfaces in strict accordance with manufacturer’s instructions.
4. Scarify concrete substrates with blast track equipment if necessary to completely remove curing compounds or other substances that would interfere with proper bond of setting materials. Clean and maintain substrate in condition required by setting material manufacturer.
5. Do not seal substrate unless required by manufacturer.
6. Prime substrate when required by manufacturer.

D. Mechanically anchor cast stone units indicated; set remainder in mortar.

E. Setting:
1. Drench cast stone components with clear, running water immediately before installation.
2. Set units in a full bed of mortar unless otherwise indicated.
3. Fill vertical joints with mortar.
4. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.

3.03 TOLERANCES

A. Joints: Make all joints 3/8 inch, except as otherwise detailed.
1. Rake mortar joints 3/4 inch for pointing.
2. Remove excess mortar from face of stone before pointing joints.
3. Point joints with mortar in layers 3/8 inch thick and tool to a slight concave profile.
4. Leave the following joints open for sealant:
   a. Head joints in top courses, including copings, parapets, cornices, sills, and steps.
   b. Joints in projecting units.
   c. Joints between rigidly anchored units, including soffits, panels, and column covers.
   d. Joints below lugged sills and stair treads.
   e. Joints below ledge and relieving angles.
   f. Joints labeled "expansion joint".

B. Installation Tolerances:
1. Variation from Plumb: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet or more.

2. Variation from Level: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet, or 3/8 inch maximum.
3. Variation in Joint Width: Not more than 1/8 inch in 36 inches or 1/4 of nominal joint width, whichever is less.
4. Variation in Plane Between Adjacent Surfaces (Lipping): Not more than 1/16 inch difference between planes of adjacent units or adjacent surfaces indicated to be flush with units.

3.04 REPAIR

A. Repair chips and other surface damage noticeable when viewed in direct daylight at 20 feet.
   1. Repair with matching touch-up material provided by the manufacturer and in accordance with manufacturer's instructions.
   2. Repair methods and results subject to Architect 's approval.

3.05 CLEANING

A. Clean completed exposed cast stone after mortar is thoroughly set and cured.
   1. Wet surfaces with water before applying cleaner.
   2. Apply cleaner to cast stone in accordance with manufacturer's instructions.
   3. Remove cleaner promptly by rinsing thoroughly with clear water.
   4. Do not use acidic cleaners.

3.06 PROTECTION

A. Protect completed work from damage.

B. Clean, repair, or restore damaged or mortar-splashed work to condition of new work.

END OF SECTION

SECTION 05 1200
STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural steel framing members and support members.

B. Base plates, shear stud connectors and expansion joint plates.

C. Grouting under base plates.

1.02 RELATED REQUIREMENTS

A. Section 05 2100 - Steel Joist Framing.

B. Section 05 3100 - Steel Decking: Support framing for small openings in deck.

C. Section 05 5000 - Metal Fabrications: Steel fabrications affecting structural steel work.

1.03 REFERENCE STANDARDS

A. AISC (MAN) - Steel Construction Manual; 2023, with Errata (2025).

B. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges; 2022, with Errata (2025).

C. AISC S303 - Code of Standard Practice for Steel Buildings and Bridges; 2016.

D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

E. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

F. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished; 2024.

G. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2021.

H. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.

I. ASTM A514/A514M - Standard Specification for High-Yield-Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding; 2022.

J. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts; 2015.

K. ASTM A563M - Standard Specification for Carbon and Alloy Steel Nuts (Metric); 2007 (Reapproved 2013).

L. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel; 2021, with Editorial Revision.

M. ASTM A992/A992M - Standard Specification for Structural Steel Shapes; 2022.

N. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2021.

O. 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; 2018a.

P. ASTM F436/F436M - Standard Specification for Hardened Steel Washers Inch and Metric Dimensions; 2018a.

Q. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength; 2015, with Editorial Revision (2018).

R. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2019, with Editorial Revision (2020).

S. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.

T. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

U. RCSC (HSBOLT) - Specification for Structural Joints Using High-Strength Bolts; Research Council on Structural Connections; 2020.

V. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:
   1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
   2. Connections and the calculations for the design of these connections.
   3. Indicate cambers and loads.
   4. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.
   5. Shop drawing sheets that include engineering information designed by the Contractor’s Delegated Design Engineer shall be signed and sealed in accordance with the Texas Engineering Practice Act. Sheets that do not provide information designed by the Contractor’s Engineer do not require being signed and sealed. Calculation packages require a signed and sealed cover sheet only. Any submittals requiring to be signed and sealed that are received without the signature and seal will be rejected without review.

C. Manufacturer's Mill Certificate: Certify that products meet or exceed specified requirements.

D. Mill Test Reports: Indicate structural strength, destructive test analysis and non-destructive test analysis.

E. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.05 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC (MAN) "Steel Construction Manual."

B. Maintain one copy of each document on site.

C. Fabricator: Company specializing in performing the work of this section with minimum three years ofdocumented experience.

D. Erector: Company specializing in performing the work of this section with minimum three years of documented experience.

E. Design connections not detailed on drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in Texas.

PART 2 PRODUCTS

2.01 MATERIALS

A. Steel Plates: ASTM A572/A572M, Grade 50.

B. Steel Angles: ASTM A572/A572M, Grade 50.

C. Steel W Shapes and Tees: ASTM A992/A992M.

D. Steel C and MC Channels: ASTM A992/A992M.

E. Cold-Formed Structural Tubing: ASTM A500/A500M, Grade C.

F. Hot-Formed Structural Tubing: ASTM A501/A501M, seamless or welded.

G. Steel Bars: ASTM A108Grade 50.

H. Steel Plate: ASTM A514/A514M.

I. Steel Sheet: ASTM A1011/A1011M, Designation SS, Grade 30 hot-rolled, or ASTM A1008/A1008M, Designation SS, Grade 30 cold-rolled.

J. Pipe: ASTM A53/A53M, Grade B, Finish black.

K. Shear Stud Connectors: Made from ASTM A108 Grade 1015 bars.

L. High-Strength Structural Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, with matching compatible ASTM A563 or ASTM A563M nuts and ASTM F436/F436M washers.

M. Headed Anchor Rods: ASTM F 1554, Grade 55, plain as indicated on the drawings.

N. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

O. Sliding Bearing Plates: Teflon coated.

P. Grout: Non-shrink, non-metallic aggregate type, complying with ASTM C 1107/C 1107M and capable of developing a minimum compressive strength of 7,000 psi at 28 days.

Q. Shop and Touch-Up Primer: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

R. Touch-Up Primer for Galvanized Surfaces: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

A. Shop fabricate to greatest extent possible.

B. Space shear stud connectors at as indicated on the drawings.

C. Continuously seal joined members by intermittent welds and plastic filler. Grind exposed welds smooth.

D. Fabricate connections for bolt, nut, and washer connectors.

E. Develop required camber for members.

2.03 FINISH

A. Prepare structural component surfaces in accordance with SSPC SP 3, Power Tool Cleaning.

B. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, or high strength bolted.

2.04 SOURCE QUALITY CONTROL

A. If any steel fabrication occurs off-site (at a fabrication shop) that is not an AISC certified fabrication shop, the Steel Fabricator shall pay for the SITA to perform the special inspections or testing required by Section 01 4533 for all such off-site steel fabrication. Source quality control testing is not required for any steel provided by an AISC certified steel fabrication shop.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

3.02 ERECTION

A. Erect structural steel in compliance with AISC 303.

B. Allow for erection loads, and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.

C. Field weld components and shear studs indicated on shop drawings.

D. Use carbon steel bolts only for temporary bracing during construction, unless otherwise specifically permitted on drawings. Install high-strength bolts in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts".

E. Do not field cut or alter structural members without approval of Architect.

F. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

G. Grout solidly between column plates and bearing surfaces, complying with manufacturer's instructions for nonshrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.

3.03 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

3.04 FIELD QUALITY CONTROL

A. A Special Inspection and Testing Agency (SITA) will perform field quality control tests and inspections, as specified in Sections 01 4516 and 01 4533.

END OF SECTION

SECTION 05 1213
ARCHITECTURALLY EXPOSED STRUCTURAL STEEL (AESS)

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. This Section includes requirements regarding the appearance and surface preparation of Architecturally Exposed Structural Steel. (AESS). Refer to division 5 section 'Structural Steel' for all other requirements regarding steel work not included in this Section.
   1. This section applies to any members noted on Architectural and Structural drawings as AESS 1, AESS 2, AESS 3, AESS 4 and AESS C; and as defined in AISC 303.

1.02 RELATED SECTIONS

A. Section 01 3000 - Administrative Requirements

B. Section 01 4000 - Quaility Requirements: For fabricator and installer qualifications.

C. Section 01 4516 - Contractor's Quality Control

D. Section 01 4533 - Code Required Quality Control: For independent testing agency procedures and administrative requirements.

E. Sections 05 1200 - Structural Steel Framing

F. Sections 05 2100 - Steel Joist Framing: For metal joist requirements.

G. Sections 05 3100 - Steel Decking: For erection requirements relating to exposed steel decking and its connections.

H. Section 05 5000 - Metal Fabrications: For loose steel bearing plates and miscellaneous steel framing.

I. Sections 09 9000 - Painting and Coating: For finish coat requirements and coordination with primer and surface preparation specified in this section

1.03 DEFINITIONS

A. Architecturally Exposed Structural Steel: Structural Steel conforming to one of the categories of Architecturally Exposed Structural Steel or AESS Refer to ANSI/AISC 303-16 “Code of Standard Practice for Steel Buildings and Bridges”.

B. AESS 1: Structural Steel designated as “AESS 1 in the contract documents and conforming to ANSI/AISC 303-16, Chapter 10 definition of AESS1. These are basic elements with workmanship requirements exceeding those in non AESS construction.

C. AESS 2: Structural Steel designated as “AESS 2 in the contract documents and conforming to ANSI/AISC 303-16, Chapter 10 definition of AESS2. These are feature elements viewed at a distance greater than 20 feet. The art of metalworking is intended to be visible to the viewer.

D. AESS 3: Structural Steel designated as “AESS 3 in the contract documents and conforming to ANSI/AISC 303-16, Chapter 10 definition of AESS3. These are feature elements viewed at a distance less than 20 feet. The art of metalworking is intended to be visible to the viewer.

E. AESS 4: Structural Steel designated as “AESS 4 in the contract documents and conforming to ANSI/AISC 303-16, Chapter 10 definition of AESS4. These are showcase elements with special surface and edge treatment beyond fabrication. The intent is the form is the only feature showing in an element.

1.04 REFERENCE STANDARDS

A. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges; 2022, with Errata (2025).

B. AISC 360 - Specification for Structural Steel Buildings; 2016.

C. ASTM A6/A6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling; 2017.

D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

E. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2021.

F. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2020.

G. ASTM A1085/A1085M - Standard Specification for Cold-Formed Welded Carbon Steel Hollow Structural Sections (HSS); 2015.

H. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

I. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

1.05 ACTION SUBMITTALS

A. General: Submit each item below according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for each type of product specified. Submit “PAINTING AND COATING” under Division 9.

C. Fabrication Documents: Detailing for fabrication of AESS components.
   1. Provide erection documents clearly indicating which members are AESS members and the AESS category of each part.
   2. Include details that clearly identify all the requirements listed in Part 2 "FABRICATION” and Part 3 “ERECTION" of this specification for each part. Provide connections for exposed AESS consistent with concepts shown on the architectural or structural drawings.
   3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length and type of each weld. Identify grinding, finish and profile of welds as defined herein.
   4. Indicate orientation of HSS seams and mill marks (where applicable).
   5. Indicate type, size, finish and length of bolts, distinguishing between shop and field bolts. Identify high-strength bolted slip-critical, direct-tensioned shear/bearing connections. Indicate which direction bolt heads should be oriented.
   6. Clearly indicate which surfaces or edges are exposed and what class of surface preparation is being used.
   7. Indicate special tolerances and erection requirements as noted on the drawings or defined herein.
   8. Indicate vent or drainage holes for HSS members.

D. Mock Up: Provide mock ups of the nature and extent indicated on the contract documents.
   1. Locate mockups on-site or in the fabricator’s shop as directed by Architect. Mockups shall be full size unless the Architect approves smaller models. Alternatively, when a mockup is not practical, the first piece of an element or connection can be used to determine acceptability.
   2. Notify the Architect one week in advance of the dates and times when mockups will be available for review.
   3. Demonstrate all applicable AESS characteristics for the specified category of AESS on the elements and joints in the mock up.
   4. Build mockups using member sizes and materials indicated for final Work.
   5. The mock up shall demonstrate weld quality and contouring of the welds at the aligned walls of the members.
   6. The mock up shall demonstrate the specified surface preparation and finish coating.
   7. HSS members shall extend at least 6" from the joint in the mock-up.

8. Obtain Architect's written approval of mockups before starting fabrication
9. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed work.
    a. Approved mockups in an undisturbed condition at the time of Substantial Completion may become part of the completed work.

1.06 INFORMATIONAL SUBMITTALS

A. General: Submit each item below according to the Conditions of the Contract and Division 1 Specification Sections.

B. Qualification data for firms and persons specified in the 'Quality Assurance" Submittal to demonstrate their capabilities and experience. Include lists of completed projects names and address, names and addresses of architects and owners, and other information specified. For each project, submit photographs showing detail of installed AESS.

1.07 QUALITY ASSURANCE

A. Fabricator Qualifications: In addition to those qualifications listed in Division 5 Section 'Structural Steel', engage an AISC Certified Fabricator, experienced in fabricating AESS similar to that indicated for this Project with a record of successful in-service performance, as well as sufficient production capacity to fabricate AESS without delaying the Work.

B. Erector Qualifications: In addition to those qualifications listed in Division 5 Section 'Structural Steel', engage an AISC Certified Erector, experienced in erecting AESS work similar in material, design, and extent to that indicted for this Project and with a record of successful in-service performance.

C. Comply with applicable provisions of the following specifications and documents:

D. Pre-installation Conference: The General Contractor shall schedule and conduct conference at the project site to comply with requirements of Division 1 Section "ADMINISTRATIVE REQUIREMENTS" As a minimum, the meeting shall include the General Contractor, Fabricator, Erector, the finish-painting subcontractor, and the Architect. Coordinate requirements for shipping, special handling, storage, attachment of safety cables and temporary erection bracing, final coating, touch up painting, mock up coordination, architect's observations, and other requirements for AESS.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver AESS to Project site in such quantities and at such times to ensure continuity of installation. All tie downs on loads shall be nylon straps or shall use softeners when using chains or wire rope slings to avoid damage to edges and surfaces of members. The standard for acceptance of delivered and erected members shall be equivalent to the standard employed at fabrication.

B. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration. Use special care in handling to prevent twisting or warping of AESS members.

C. Handle finish pieces using nylon type slings, or chains with softeners, or wire ropes with softeners such that they are not damaged. Conform to ANSI/AISC 303-16 Sections 10.4, 10.5, and 10.6.

1.09 PROJECT CONDITIONS

A. Field Measurements: Where AESS is indicated to fit against walls and other construction, verify dimensions by field measurements before fabrication and indicate measurements on Fabrication Documents. Coordinate fabrication schedule with construction progress to avoid delaying the work.

1.10 COORDINATION

A. Coordinate installation of anchors for AESS members that connect to the work of other trades. Furnish setting drawings, templates, and directions for installing anchors, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to the project site in time for installation. Anchorage concepts shall be as indicated on drawings and approved on final Fabrication Documents.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General: Meet requirements Division 5 Section 'STRUCTURAL STEEL FRAMING 05 1200' as amended below.

B. High-Strength Bolts, Nuts, and Washers: Per section 05 1200 heavy hex heads and nuts Provide rounded bolt heads with twist off bolts. Provide standard carbon steel finish.

2.02 PAINT SYSTEM

A. Compatibility: All components/procedures of the AESS paint system shall conform to the coating system specified, submitted, and approved per Division 9. As a minimum identify required surface preparation, primer, intermediate coat (if applicable), and finish coat. Primer, intermediate coating and finish coating shall be from a single manufacturer combined in a system documented by the manufacturer with adequate guidance for the fabricator to procure and execute.

B. Primer: As specified in 09 9000 “PAINTING AND COATING”, and 07 1823 "INTUMESCENT FIRE PROTECTION" primer shall comply with all federal standards for VOC, lead and chromate levels

C. Finish Coating: Field apply intermediate and top coats per section 09 9000 “PAINTING AND COATING”.

2.03 FABRICATION AESS 1

A. Use special care in handling and shipping of AESS both before and after shop painting minimize damage to any shop finish. Use Nylon type slings or softeners when using chains or wire rope slings.

B. The permissible tolerances for member depth, width, out of square, and camber and sweep shall be as specified in ASTM A6/A6M-2014 Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling (ASTM A6/A6M), ASTM A500/A500M-2013 Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes (ASTM A500/A500M), and Standard Specification for Cold-Formed Welded Carbon Steel Structural Sections (HSS) (((ASTM A1085/A1085M))).

C. Fabricate and assemble AESS in the shop to the greatest extent possible. Locate field joints in AESS assemblies at concealed locations or as approved by the Architect. Detail AESS assemblies to minimize field handling and expedite erection.

D. Remove blemishes or unsightly surfaces resulting from temporary braces or fixtures.

E. Remove all backing and run out tabs.

F. Grind all sharp edges smooth, including all sheared, punched or flame cut edges

G. Provide a continuous appearance to all welded joints including tack welds. Provide joint filler at intermittent welds.

H. Bolted Connections: Make in accordance with Section 05 1200. Provide bolt type and finish as noted herein.

I. Weld Connections: Comply with AWS D1.1 and Section 05 1200. Appearance and quality of welds shall be consistent. Assemble and weld built-up sections by methods that will maintain alignment of members without warp exceeding the tolerance of this section.

J. Install all bolts on the same side of the connection. Oriented uniformly in the direction indicated Consistent from one connection to another.

K. Remove all weld spatter, slivers and similar surface discontinuities.

L. Grind off projections larger than 1/16” at butt and plug welds.

M. Continuous Weld Appearance: Where continuous welding is noted on the drawings, provide welds of a uniform size and profile

N. Seal Welds: Seal weld open ends of round and rectangular hollow structural section with 3/8" closure plates. Provide venting as required for galvanized members.

2.04 FABRICATION AESS 2

A. Fabricate to Requirements of 2.03 and as follows

B. The as-fabricated straightness tolerance shall be one-half of that specified in ASTM A6/A6M, ASTM A500/A500M, or ASTM A1085/A1085M.

C. For curved structural members, whether composed of a single standard structural shape or built-up, the as-fabricated variation from the theoretical curvature shall be equal to or less than the standard camber and sweep tolerances permitted for straight members in the applicable ASTM standard.

D. The tolerance on overall profile dimensions of welded built-up members shall one-half of that specified in AWS D1.1/D1.1M: 2015 Structural Welding Code – Steel (AWS D1.1).

E. Provide hidden part marks or piece marks that may be fully removed after erection.

2.05 FABRICATION AESS 3

A. Fabricate to Requirements of 2.04 and as follows

B. Fabricate AESS with exposed surfaces smooth, square and of surface quality consistent with the approved mock up.

C. Grind projections at butt and plug welds to be smooth with the adjacent surface.

D. Orientation of HSS seams shall be as shown. If not indicated, Contractor shall request orientation in shop drawings.

E. Copes, miters, and cuts in surfaces exposed to view shall have a maximum gap of 1/8” in an open joint. If the gap is shown to be in contact, the contact shall be uniform within 1/16”.

F. Mill marks shall not be exposed to view. If it is not possible to hide mill marks, then the mill marks are to be removed by appropriate length cutting of mill material. If this is not possible, the fabricator shall remove the mill mark, grind, and fill the surface to be consistent with the approved mock up.

G. The matching of abutting cross sections is required

2.06 FABRICATION AESS 4

A. Fabricate to the requirements of 2.05 and as follows.

B. Contouring and blending of welds: Where welds are indicated to be ground contoured, or blended, oversize welds as required and grind to provide a smooth transition and match profile on approved mock-up.

C. Minimize Weld Show Through: At locations where welding on the opposite side of an exposed connection creates distortion, weld show through shall be minimized to conform to the approved mock up.

D. Open holes shall be filled with weld metal or body filler and smoothed by grinding or filling to the standards applicable to the shop fabrication of the materials.

2.07 SHOP PRIMING

A. Provide surface preparations to SSPC-SP6. Coordinate the required surface profile with the approved paint submittal prior to beginning surface preparation. Prior to blasting remove any grease and oil using solvent cleaning to meet SSPC-SP 1. Weld spatter, slivers and similar surface discontinuities shall be removed. Sharp corners resulting from shearing, flame cutting or grinding shall be eased.

B. 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.
      a. Surfaces to be high-strength bolted with slip-critical connections,

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's instructions to provide a dry film thickness of not less than 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
   1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
   2. Apply two coats of shop primer to surfaces that are inaccessible after assembly or erection.

2.08 FABRICATION QUALITY CONTROL AND QUALITY ASSURANCE AESS 1 AND 2

A. Structural requirements:
   1. Conform to Quality Control requirements per ANSI/AISC 360-16 "Specification for Structural Steel Buildings" Chapter N and ANSI/AISC 303-16," Code of Standard Practice for Steel Buildings and Bridges", Section 10. Refer to Section 05 12 00 "Structural Steel" for additional requirements.
   2. Owner will engage a Quality Assurance agency per the requirements of ANSI/AISC 360-16 "Specification for Structural Steel Buildings" Chapter N and ANSI/AISC 303-16," Code of Standard Practice for Steel Buildings and Bridges", Section 10

B. AESS acceptance: The Architect shall observe the AESS steel in the shop at a viewing distance consistent with the final installation and determine acceptability based on the qualification data and submittals. The Quality Assurance agency shall have no responsibility for enforcing the requirements of this section.

2.09 FABRICATION QUALITY CONTROL AND QUALITY ASSURANCE AESS 3, 4 AND C

A. Conform to 2.10 and as follows.

B. AESS acceptance: The Architect shall observe the AESS steel in the shop at a viewing distance consistent with the final installation and determine acceptability based on the approved mock up. The Quality Assurance Agency shall have no responsibility for enforcing the requirements of this section.

PART 3 – EXECUTION

3.01 EXAMINATION

A. The erector shall check all AESS members upon delivery for twist, kinks, gouges or other imperfections which may result in rejection of the appearance of the member. Coordinate remedial action with fabricator prior to erecting steel.

3.02 PREPARATION

A. Provide connections for temporary shoring, bracing and supports only where noted on the approved Fabrication Documents. Temporary connections not shown shall be made at locations not exposed to view in the final structure or as approved by the Architect. Handle, lift and align pieces using nylon straps or chains with softeners required to maintain the appearance of the AESS through the process of erection.

3.03 ERECTION AESS 1

A. Employ special care to handle and erect AESS. Erect finish pieces using nylon straps or chains with softeners such that they are not damaged.

B. Place weld tabs for temporary bracing and safety cabling at points concealed from view in the completed structure or where approved by the Architect during the pre-installation meeting. Methods of removing temporary erection devices and finishing the AESS members shall be approved by the Architect prior to erection.

C. AESS Erection tolerances: Erection tolerances shall meet the requirements of standard frame tolerances for structural steel per Chapter 7 of ANSI/AISC 303-16.

D. Set AESS accurately in locations and to elevations indicated and according to AISC specifications referenced in this Section.

E. Remove blemishes or unsightly surfaces resulting from temporary braces or fixtures.

F. Remove all backing and run out tabs.

G. When temporary braces or fixtures are required to facilitate erection, care shall be taken to avoid any blemishes, holes or unsightly surfaces resulting from the use or removal of such temporary elements.

H. Bolted Connections: Align bolt heads on the same side of the connection as indicated on the approved fabrication or erection documents.

I. Weld Connections: Comply with AWS D1.1 and Section 05 12 00. Appearance and quality of welds shall be consistent. Employ methods that will maintain alignment of members without warp exceeding the tolerance of this section.

J. Remove all weld spatter exposed to view.

K. Grind off projections larger than 1/16” at field butt and plug welds.

L. Continuous Welds: Where continuous welding is noted on the drawings, provide continuous welds of a uniform size and profile.

M. Do not enlarge holes in members by burning or by using drift pins. Ream holes that must be enlarged to admit bolts. Replace connection plates that are misaligned where holes cannot be aligned with acceptable final appearance.

N. Splice members only where indicated.

O. Obtain permission for any torch cutting or field fabrication from the Architect. Finish sections thermally cut during erection to a surface appearance consistent with the mock up.

3.04 ERECTION AESS 2

A. Erect to the requirements of 3.03 and as follows.

B. AESS Erection Tolerances: Erect to standard frame tolerances for structural steel per Chapter 7 of ANSI/AISC 303-16.

3.05 ERECTION AESS 3

A. Erect to the requirements of 3.04 and as follows.

B. Field Welding: Weld profile, quality, and finish shall be consistent with mock-ups approved prior to fabrication.

C. Provide a continuous appearance to all welded joints including tack welds. Provide joint filler at intermittent welds.

3.06 ERECTION AESS 4

A. Erect to the requirements of 3.05 and as follows.

B. Welds ground smooth: Erector shall grind welds smooth.

C. Minimize Weld Show Through: At locations where welding on the far side of an exposed connection creates distortion, grind distortion and marking of the steel to a smooth profile with adjacent material.

D. Filling of weld access holes: Where holes must be cut in the web at the intersection with flanges on W shapes and structural tees to permit field welding of the flanges, they shall be filled with joint filler.

E. Where welds are indicated to be ground, contoured, or blended, oversize welds as required and grind to provide a smooth transition and match profile on approved mock-up.

3.07 FIELD QUALITY CONTROL AND QUALITY ASSURANCE AESS 1 AND 2

A. Structural requirements:
   1. Conform to Quality Control requirements per ANSI/AISC 360-16 “Specification for Structural Steel Buildings” Chapter N and ANSI/AISC 303-16,” Code of Standard Practice for Steel Buildings and Bridges”, Section 10. Refer to Section 05 12 00 “Structural Steel” for additional requirements.
      a. Owner will engage a Quality Assurance agency per the requirements of ANSI/AISC 360-16 “Specification for Structural Steel Buildings” Chapter N and ANSI/AISC 303-16,” Code of Standard Practice for Steel Buildings and Bridges”, Section 10

B. AESS acceptance: The Architect shall observe the AESS steel in place and determine acceptability based on the qualification data and submittals. The Quality Assurance Agency shall have no responsibility for enforcing the requirements of this section.

3.08 FIELD QUALITY CONTROL AESS 3, 4, AND C

A. Conform to 3.08 and as follows.

B. AESS acceptance: The Architect shall observe the AESS steel in place and determine acceptability based on the approved mock up. The Quality Assurance Agency shall have no responsibility for enforcing the requirements of this section.

3.09 ADJUSTING AND CLEANING

A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint shall be completed to blend with the adjacent surfaces of AESS. Such touch up work shall be done in accordance with manufacturer's instructions and as specified in Division 9, Section “Painting.”

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded area. Any repairs to galvanized surfaces shall comply with ASTM A780/A780M – 2015 Standard Practice for Repair of Damaged and Uncoated Areas of Hot Dip Galvanized Coatings.

END OF SECTION

SECTION 05 2100
STEEL JOIST FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Open web steel joistsand shear stud connectors, with bridging, attached seats and anchors.

B. Loose bearing members, such as plates or angles, and anchor bolts for site placement.

C. Supplementary framing for floor and roof openings greater than 18 inches.

1.02 RELATED REQUIREMENTS

A. Section 05 1200 - Structural Steel Framing: Grouting base plates and bearing plates. Superstructure framing.

B. Section 05 1200 - Structural Steel Framing: Superstructure framing.

C. Section 05 3100 - Steel Decking: Support framing for openings less than 18 inches in decking.

D. Section 05 5000 - Metal Fabrications: Non-framing steel fabrications attached to joists.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished; 2024.

C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

D. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014 (Editorial 2017).

E. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

F. SJI (SPEC) - Catalog of Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders; 2011.

G. SJI 100 - Standard Specifications for K-Series, LH-Series, and DLH-Series Open Web Steel Joists, and for Joist Girders; 2020.

H. SJI Technical Digest No. 9 - Handling and Erection of Steel Joists and Joist Girders; 2025.

I. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

J. SSPC-SP 2 - Hand Tool Cleaning; 2024.

K. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate standard designations, joist coding, configurations, sizes, spacings, cambers, locations of joists, joist leg extensions, bridging, connections, and attachments.

C. Shop drawing sheets that include engineering information designed by the Contractor’s Delegated Design Engineer shall be signed and sealed in accordance with the Texas Engineering Practice Act. Sheets that do not provide information designed by the Contractor’s Engineer do not require being signed and sealed. Calculation packages require a signed and sealed cover sheet only. Any submittals requiring to be signed and sealed that are received without the signature and seal will be rejected without review.

D. Welders' Certificates: Submit manufacturer's certificates, certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.05 QUALITY ASSURANCE

A. Design connections not detailed on drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in Texas.

B. Perform Work, including that for headers and other supplementary framing, in accordance with SJI 100 Standard Specifications Load Tables and SJI Technical Digest No. 9.

C. Manufacturer Qualifications: Company specializing in performing the work of this section with minimum three yearsdocumented experience.

D. Erector Qualifications: Company specializing in performing the work of this section with minimum three yearsdocumented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Transport, handle, store, and protect products to SJI requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Steel Joists:
   1. Canam Group Inc: www.canam-steeljoists.ws
   2. Nucor-Vulcraft Group: www.vulcraft.com/#sle.
   3. New Mellennium Building Systems, LLC: www.newmill.com
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Open Web Joists: SJI Type K Joists:
   1. Provide bottom and top chord extensions as indicated.
   2. Minimum End Bearing on Steel Supports: As shown on the drawings.
   3. Minimum End Bearing on Concrete or Masonry Supports: As shown on drawings.
   4. Finish: Shop primed.

B. Open Web Joists: SJI 100 Type LH Joists:
   1. Provide bottom chord extensions as indicated.
   2. Minimum End Bearing on Steel Supports: Comply with referenced SJI standards.
   3. Minimum End Bearing on Masonry or Concrete Supports: Comply with referenced SJI standards.
   4. Finish: Shop primed.

C. Open Web Joists: SJI 100 Type DLH Joists:
   1. Provide bottom chord extensions as indicated.
   2. Minimum End Bearing on Steel Supports: Comply with referenced SJI standards.
   3. Minimum End Bearing on Masonry or Concrete Supports: Comply with referenced SJI standards.
   4. Finish: Shop primed.

D. Anchor Bolts, Nuts and Washers: ASTM A307 hot-dip galvanized per ASTM A153/A153M Class C.

E. Shear Stud Connectors: Made from ASTM A108 Grade 1015 bars.

F. Structural Steel For Supplementary Framing and Joist Leg Extensions: ASTM A 36/A 36M.

G. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

H. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.03 FABRICATION

A. Frame special sized openings in joist web framing as detailed.

2.04 FINISH

A. Shop prime joists as specified.
   1. Do not prime surfaces that will be fireproofed, field welded, or in contact with concrete.

B. Prepare surfaces to be finished in accordance with SSPC-SP 2.

2.05 SOURCE QUALITY CONTROL

A. For joist fabrication that occurs at a joist fabrication shop that is not an SJI certified joist fabrication shop, the Joist Fabricator shall pay for the SITA to perform the special inspections or testing required by Section 01 4533 for all such off-site steel fabrication. Source quality control testing is not required for any joists provided by an SJI certified joist fabrication shop.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions prior to beginning work.

3.02 ERECTION

A. Erect joists with correct bearing on supports.

B. Allow for erection loads. Provide sufficient temporary bracing to maintain framing safe, plumb, and in true alignment.

C. Coordinate the placement of anchors for securing loose bearing members furnished as part of the work of this section.

D. After joist alignment and installation of framing, field weld joist seats to steel bearing surfaces.

E. Position and field weld joist chord extensions and wall attachments as detailed.

F. Install supplementary framing for floor and roof openings greater than 18 inches.

G. Do not permit erection of decking until joists are braced, bridged, and secured or until completion of erection and installation of permanent bridging and bracing.

H. Do not field cut or alter structural members without approval of joist manufacturer.

I. After erection, prime welds, damaged shop primer, and surfaces not shop primed , except surfaces specified not to be primed.

3.03 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch.

B. Maximum Offset From True Alignment: 1/4 inch.

3.04 FIELD QUALITY CONTROL

A. A Special Inspection and Testing Agency (SITA) will perform field quality control tests and inspections, as specified in Sections 01 4516 and 01 4533.

END OF SECTION

SECTION 05 3100
STEEL DECKING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof deck.

B. Composite floor deck.

C. Supplementary framing for openings up to and including 18 inches.

D. Bearing plates and angles.

E. Stud shear connectors.

F. Acoustical insulation in roof deck flutes.

1.02 RELATED REQUIREMENTS

A. Section 03 2000 - Concrete Reinforcing.

B. Section 03 3000 - Cast-in-Place Concrete: Concrete topping over metal deck.

C. Section 05 1200 - Structural Steel Framing: Support framing for openings larger than 18 inches and shear stud connectors.

D. Section 05 5000 - Metal Fabrications: Steel angle concrete stops at deck edges.

E. Section 09 9000 - Painting and Coating

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished; 2024.

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 A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2021.

E. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

F. FM (AG) - FM Approval Guide; current edition.

G. ICC-ES AC70 - Acceptance Criteria for Power-Actuated Fasteners Driven into Concrete, Steel and Masonry Elements; 2019, with Editorial Revision (2021).

H. SDI (DM) - Publication No.30, Design Manual for Composite Decks, Form Decks, and Roof Decks; 2007.

I. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

J. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittals procedures.

B. Product Data: Provide deck profile characteristics, dimensions, structural properties, and finishes.

C. Shop Drawings: Indicate deck plan, support locations, projections, openings, reinforcement, pertinent details, and accessories.

D. Shop drawing sheets that include engineering information designed by the Contractor's Delegated Design Engineer shall be signed and sealed in accordance with the Texas Engineering Practice Act. Sheets that do not provide information designed by the Contractor's Engineer do not require being signed and sealed. Calculation packages require a signed and sealed cover sheet only. Any submittals requiring to be signed and sealed that are received without the signature and seal will be rejected without review.

E. Certificates: Certify that products furnished meet or exceed specified requirements.

F. Submit manufacturer's installation instructions.

G. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.05 QUALITY ASSURANCE

A. Design deck layout, spans, fastening, and joints under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in Texas.

B. Installer Qualifications: Company specializing in performing the work of this Section with minimum three years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Cut plastic wrap to encourage ventilation.

B. Separate sheets and store deck on dry wood sleepers; slope for positive drainage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Steel Deck:
   1. Canam Steel Corporation: www.canam-steeljoists.ws.
   2. CSI - Metal Dek Group: www.metaldek.com
   3. Nucor-Vulcraft Group: www.vulcraft.com.
   4. New Mellennium Building Systems, LLC: www.newmill.com
   5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 STEEL DECK

A. Roof Deck:
   1. Type "B": Non-composite type, fluted steel sheet
   2. Type "N": Non-composite type, fluted steel sheet Cellular Deck
   3. Steel Sheet:
      a. Ungalvanized Steel Sheet: ASTM A1008/1008M, Designation SS, Grade 50. (typical) except where metal roof deck is to receive cementitious fireproofing.
      b. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 50, with G90/Z275 galvanized coating where metal roof deck is to receive cementitious fireproofing.
   4. Primer: Shop coat of manufacturer's standard primer paint over cleaned and phosphatized substrate. See Section 09 9000 - 'Painting and Coating' for any additional requirements.
   5. Structural Properties:
      a. Span Design:
         1) Type "B": Triple
         2) Type "N": Double
   6. Minimum Metal Thickness, Excluding Finish (unless noted otherwise on the Structural Drawings):
      a. Type "B": 20 Gage
      b. Type "N": 16/16 Gage
   7. Nominal Height:
      a. Type "B": 1-1/2"

b. Type "N": 3"

8. Profile:
   a. Type "B": Fluted; SDI WR
   b. Type "N": Fluted; SDI Deep WR
9. Formed Sheet Width:
   a. Type "B": 36 inch
   b. Type "N": 24 inch or 32 inch
10. Deck Attachment (Unless noted otherwise on the Structural Drawings):
    a. Side Joints: _____Both Ends Lapped or Butted.
       1) Type "B": Mechanically fastened. #10 Tek screws spaced at a maximum of 12" OC.
       2) Type "N": 1-1/2" top arch seam weld spaced at a maximum of 12" OC.
    b. End Joints/Fasteners and Intermediate Support Fasteners: _____Both ends Lapped or Butted, Welded.
       1) Type "B": 5/8" puddle welds on a 36/7 pattern
       2) Type "N": 5/8" puddle welds on a 32/5 pattern or 24/4 pattern
    c. Side Support Fasteners: Welds matching End joint fasteners at 6" on center

B. Composite Floor Deck: Fluted steel sheet embossed to interlock with concrete:
   1. Galvanized Steel Sheet: Structural Steel (SS) Grade 50, with G60/Z180 galvanized coating.
   2. Minimum Base Metal Thickness: 18 gage, 0.0474 inch.
   3. Nominal Height: 2 inches.
   4. Profile: Fluted. Equal to 2VLI as manufactured by Vulcraft
   5. Formed Sheet Width: 36 inch.
   6. Side Joints: Lock seam with button punches as required by deck manufacturer for construction purposes but not greater than 36" OC.
   7. End Joints/Fasteners and Intermediate Support Fasteners: Lapped, welded. 5/8" diameter puddle welds on a 36/4 pattern
   8. Side Support Fasteners: 5/8" diameter puddle welds with a maximum spacing of 6" on center.
   9. See Section 09 9000 - 'Painting and Coating' for any additional requirements for finish where composite floor deck occurs over crawl space.

2.03 ACCESSORY MATERIALS

A. Bearing Plates and Angles: ASTM A36/A36M steelunfinished.

B. Stud Shear Connectors: Made from ASTM A 108 Grade 1015 bars.

C. Welding Materials: AWS D1.1/D1.1M.

D. Fasteners: Galvanized hardened steel, self tapping.

E. Powder Actuated Mechanical Fasteners: Steel; with knurled shank and forged ballistic point. Comply with applicable requirements of ICC-ES AC70.
   1. Design Requirements: Provide number and type of fasteners that comply with the applicable requirements of SDI (DM) design method for roof deck and floor deck applications and ICC-ES AC43.
   2. Material: Steel; ASTM A510/A510M.
      a. Hardness: Rockwell C 54.5, minimum.
      b. Tensile Strength: 285 kips per square inch, minimum.
      c. Shear Strength: 175 kips per square inch, minimum.
      d. Washers:
         1) Steel Bar Joist Framing Applications: 0.472 inch diameter, minimum.
         2) Exposed Roof Deck Applications: 0.591 inch diameter, minimum.
      e. Corrosion Resistance:

1) Steel Bar Joist Framing Applications: ASTM B633, SC1, Type III zinc electroplate..
2) Exposed Roof Deck Applications: Provide manufacturer's standard stainless steel sealing caps with bonded neoprene washer over each fastener.

F. Mechanical Fasteners: Steel; hex washer head, self-drilling, self-tapping.
1. Design Requirements for Sidelap Connections: Provide number and type of fasteners that comply with the applicable requirements of SDI (DM) design method for roof deck and floor deck applications and ICC-ES AC43.
2. Fasteners for Steel Roof Decks Protected with Waterproofing Membrane: ASTM B633, SC1, Type III zinc electroplate.
3. Fasteners for Exposed Steel Roof Deck Application: Manufacturer's standard stainless steel with bonded neoprene washer.

G. Weld Washers: Mild steel, uncoated, 3/4 inch outside diameter, 1/8 inch thick.

H. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, complying with VOC limitations of authorities having jurisdiction.

I. Flute Closures: Closed cell foam rubber, 1 inch thick minimum; profiled to fit tight to the deck with continuous sealant around entire air dam flute closure profile for continuous seal where deck transitions from interior to exterior conditions. Where deck extends past exterior walls: air dam flute closure assembly shall be provided to prohibit air movement. Air dam assembly shall maintain less than 0.02 cfm/ft2 at 1.57 lb/ft2 of allowable air infiltration.

J. Acoustical Insulation: Glass fiber type, minimum 1.1 lb/cu ft density; profiled to suit deck at interior conditions only.

2.04 FABRICATED DECK ACCESSORIES

A. Sheet Metal Deck Accessories: Metal closure strips, wet concrete stops, and cover plates, 20 gage, 0.0359 inch thick sheet steel; of profile and size as indicated; finished same as deck.

B. Cant Strips: Formed sheet steel, 20 gage, 0.0359 inch minimum thickness, 45 degree slope, 3-1/2 inch nominal width and height, flange for attachment.

C. Roof Sump Pans: Formed sheet steel, 14 gage, 0.0747 inch minimum thickness, flat bottom, sloped sides, recessed 1-1/2 inches below roof deck surface, bearing flange 3 inches wide, sealed watertight.

D. Floor Drain Pans: Formed sheet steel, 14 gage, 0.0747 inch minimum thickness, flat bottom, sloped sides, recessed 1-1/2 inches below floor deck surface, bearing flange 3 inches wide, sealed watertight.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions prior to beginning work.

3.02 FIELD QUALITY CONTROL

A. A Special Inspection and Testing Agency (SITA) will perform field quality control tests and inspections, as specified in Sections 01 4516 and 01 4533.

3.03 INSTALLATION

A. Erect metal deck in accordance with SDI Design Manual. Align and level.

B. On concrete surfaces provide minimum 4 inch bearing.

C. On steel supports provide minimum 1-1/2 inch bearing.

D. Fasten deck to steel support members at ends and intermediate supports as indicated in section 2.02, parallel with the deck flute and at every other transverse flute using methods indicated on drawings.
1. Welding: Use fusion welds through weld washers.

2. Place and secure special deep fluted sections for integral concrete bridging.

E. At mechanically fastened male/female side laps fasten as indicated in section 2.02.

F. Drive mechanical sidelap connectors completely through adjacent lapped sheets; positively engage adjacent sheets with minimum three-thread penetration.

G. At welded male/female side laps weld at 18 inches on center maximum.

H. Weld deck in accordance with AWS D1.3/D1.3M.

I. At deck openings greater than 8 inches, provide support per Structural Drawings. Place angles perpendicular to flutes; extend minimum two flutes beyond each side of opening and fusion weld to deck at each flute.

J. Where deck (other than cellular deck electrical raceway) changes direction, install 6 inch minimum wide sheet steel cover plates, of same thickness as deck, fusion weld 12 inches on center maximum, unless alternative detail is provided in the Structural Drawings.

K. At floor edges, install concrete stops upturned to top surface of slab, to contain wet concrete. Provide stops of sufficient strength to remain stationary without distortion.

L. At openings between deck and walls, columns, and openings, provide sheet steel closures and angle flashings to close openings.

M. Close openings above walls and partitions parallel and perpendicular to deck flutes with double row of foam cell closures. At exterior walls: provide air dam flute closure assembly to prohibit air movement. Air dam assembly shall maintain less than 0.02 cfm/ft2 at 1.57 lb/ft2 of allowable air infiltration.

N. Place metal cant strips in position and mechanically attach.

O. Position roof drain pans with flange bearing on top surface of deck. Fusion weld at each deck flute.

P. Position floor drain pans with flange bearing on top surface of deck. Fusion weld at each deck flute.

Q. Weld stud shear connectors through steel deck to structural members below.

R. Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating, with touch-up primer.

END OF SECTION

SECTION 05 4000
COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Formed steel stud exterior wall and interior wall framing, both load-bearing and non-load-bearing, including soffit framing and other non-structural miscellaneous framing.

B. Formed steel joist and purlin framing and bridging.

1.02 RELATED REQUIREMENTS

A. Section 05 1200 - Structural Steel Framing.

B. Section 05 3100 - Steel Decking.

C. Section 06 1000 - Rough Carpentry: Wood blocking and miscellaneous framing.

1.03 REFERENCE STANDARDS

A. AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members; 2012.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

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 A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2021.

E. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories; 2020.

F. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

G. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with work of other sections that is to be installed in or adjacent to the metal framing system, including but not limited to structural anchors, cladding anchors, utilities, insulation, and firestopping.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on standard framing members; describe materials and finish, product criteria, limitations.

C. Product Data: Provide manufacturer's data on factory-made framing connectors, showing compliance with requirements.

D. Shop Drawings: Indicate component details, framed openings, bearing, anchorage, loading, welds, and type and location of fasteners, and accessories or items required of related work.
   1. Indicate stud, floor joist, ceiling joist, roof rafter, and roof truss layout.
   2. Describe method for securing studs and all of the cold formed metal framing to tracks and any other boundary supports all framing connections.
   3. Design data:

a. Shop drawing sheets that include engineering information designed by the Contractor's Delegated Design Engineer shall be signed and sealed in accordance with the Texas Engineering Practice Act. Sheets that do not provide information designed by the Contractor's Engineer do not require being signed and sealed. Calculation packages require a signed and sealed cover sheet only. Any submittals requiring to be signed and sealed that are received without the signature and seal will be rejected without review.

E. Manufacturer's Installation Instructions: Indicate special procedures, conditions requiring special attention .

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Design framing system under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in Texas.

B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, and with minimum five years of documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by manufacturer.

1.07 MOCK-UP

A. Provide mock-up of exterior framed wall, including components specified elsewhere, such as insulation, sheathing, window frame, door frame, exterior wall finish, and interior wall finish.

B. Mock-Up Size: 4 by 4 feet, including corner condition.

C. Location: As directed.

D. Mock-up may not remain as part of the Work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Framing:
1. CEMCO: www.cemcosteel.com.
2. ClarkDietrich Building Systems: www.clarkdietrich.com.
3. MarinoWARE: www.marinoware.com/#sle.
4. Mill Steel Company: www.millsteelframing.com
5. Telling Industries, LLC: www.buildstrong.com.
6. Substitutions: See Section 01 6000 - Product Requirements.

B. Framing Connectors and Accessories:
1. Same manufacturer as metal framing.
2. Simpson Strong Tie: www.strongtie.com.
3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FRAMING SYSTEM

A. Provide primary and secondary framing members, straight and curved track, bridging, bracing, plates, gussets, clips, fittings, reinforcement, and fastenings as required to provide a complete framing system.

B. Design Requirements: Provide completed framing system having the following characteristics:
1. Design: Calculate structural characteristics of cold-formed steel framing members according to AISI S100-12.
2. Structural Performance: Design, engineer, fabricate, and erect to withstand specified design loads for project conditions within required limits.
3. Design Loads: As indicated on the drawings.
4. Wind and Live load deflection meeting the following, unless otherwise indicated:
a. Floors: Maximum vertical deflection under live load of 1/360 of span.

b. Roofs: Maximum vertical deflection under live load of 1/180 over areas without a ceiling, 1/240 over areas with a nonplaster ceiling and 1/360 over areas with a plaster ceiling.
c. Interior Walls that have no exposure to exterior wind pressures: Maximum horizontal deflection under interior wind pressures of 1/360 of span.
d. Exterior Walls: Maximum horizontal deflection under service level Components and Cladding wind load of 1/600 of span where masonry veneer or plaster is outside of the stud wall and 1/360 of span where metal panel or flexible finishes are outside of the stud wall.

5. Able to tolerate movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
6. Able to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

C. Shop fabricate framing system to the greatest extent possible.

D. Deliver to site in largest practical sections.

2.03 FRAMING MATERIALS

A. Studs and Track: ASTM C955; studs formed to channel, "C", or "Sigma" shape with punched web; U-shaped track in matching nominal width and compatible height.
1. Gage and depth: Minimum 18 gage thickness for exterior walls, and depth as shown on the drawings. Minimum 25 gage thickness for interior walls, and depth as shown on the drawings. The Cold Formed Metal Framing Engineer may increase the gage and decrease the spacing as required for design but may not increase the depth as shown on the drawings.
2. Galvanized in accordance with ASTM A653/A653M, G60/Z180 coating.
3. Provide components fabricated from ASTM A 1008/A 1008M, Designation SS steel.

B. Joists and Purlins: Fabricated from ASTM A653/A653M steel sheet, with G60/Z180 hot dipped galvanized coating.
1. Base Metal: Structural Steel (SS), Grade 33/230.
2. Gage and depth: Minimum 18 gage thick, and depth as shown on the drawings. The Cold Formed Metal Framing Engineer may increase the gage and decrease the spacing as required for design but may not increase the depth as shown on the drawings.

C. Framing Connectors: Factory-made, formed steel sheet.
1. Structural Performance: Maintain load and movement capacity required by applicable code, when evaluated in accordance with AISI S100-12.
2. Movement Connections: Provide mechanical anchorage devices that accommodate movement using slotted holes, shouldered screws or screws and anti-friction or stepped bushings, while maintaining structural performance of framing. Provide movement connections at the following locations:
a. Where continuous studs bypass elevated floor slab, connect stud to slab in manner allowing vertical and horizontal movement of slab without affecting studs; allow for minimum movement of 1/2 inch.
b. Where top of stud wall terminates below structural floor or roof, connect studs to structure in manner allowing vertical and horizontal movement of slab without affecting studs; allow for minimum movement of 1/2 inch.
c. Provide top track with long leg track and head of wall movement connectors; minimum track length of 12 feet.
3. Fixed Connections: Provide non-movement connections for tie-down to foundation, floor-to-floor tie-down, roof-to-wall tie-down, joist hangers, gusset plates, and stiffeners.

2.04 FASTENERS

A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: Hot dip galvanized per ASTM A153/A153M.

B. Anchorage Devices: Powder actuated, Drilled expansion bolts, and Screws with sleeves.

C. Welding: Comply with AWS D1.1/D1.1M.

2.05 ACCESSORIES

A. Bracing, Furring, Bridging: Formed sheet steel, thickness determined for conditions encountered; finish to match framing components.

B. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that building framing components are ready to receive work.

B. Verify field measurements and adjust installation as required.

3.02 INSTALLATION OF STUDS

A. Install components in accordance with ASTM C1007 requirements and ASTM C1007 requirements.

B. Align floor and ceiling tracks; locate to wall layout. Secure in place with fasteners at maximum 24 inches on center. Coordinate installation of sealant with floor and ceiling tracks.

C. Place studs at 16 inches on center, maximum; not more than 2 inches from abutting walls and at each side of openings. Connect studs to tracks using fastener method.

D. Construct corners using minimum of three studs. Install double studs at wall openings, door and window jambs.

E. Install load bearing studs full length in one piece. Splicing of studs is not permitted.

F. Install load bearing studs, brace, and reinforce to develop full strength and achieve design requirements.

G. Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.

H. Install intermediate studs above and below openings to align with wall stud spacing.

I. Provide deflection allowance in stud track, directly below horizontal building framing at non-load bearing framing.

J. Attach cross studs to studs for attachment of fixtures anchored to walls.

K. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.

L. Touch-up field welds and damaged galvanized surfaces with primer.

3.03 INSTALLATION OF JOISTS AND PURLINS

A. Install framing components in accordance with manufacturer's instructions.

B. Make provisions for erection stresses. Provide temporary alignment and bracing.

C. Place joists at 16 inches on center; not more than 2 inches from abutting walls. Connect joists to supports using fastener method.

D. Set floor and ceiling joists parallel and level, with lateral bracing and bridging.

E. Locate joist end bearing directly over load bearing studs or provide load distributing member to top of stud track.

F. Provide web stiffeners at reaction points.

G. Touch-up field welds and damaged galvanized surfaces with primer.

3.04 TOLERANCES

A. Maximum Variation from True Position: 1/4 inch.

B. Maximum Variation of any Member from Plane: 1/4 inch.

END OF SECTION

SECTION 05 5000
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated steel items.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.

B. Section 04 2000 - Unit Masonry: Placement of metal fabrications in masonry.

C. Section 05 1200 - Structural Steel Framing: Structural steel column anchor bolts.

D. Section 05 2100 - Steel Joist Framing: Structural joist bearing plates, including anchorage.

E. Section 05 3100 - Steel Decking: Bearing plates for metal deck bearing, including anchorage.

F. Section 05 5100 - Metal Stairs.

G. Section 05 5133 - Metal Ladders.

H. Section 05 5213 - Pipe and Tube Railings.

I. Section 09 9000 - Painting and Coating.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

E. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2013.

F. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2021.

G. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

H. 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; 2018a.

I. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2019, with Editorial Revision (2020).

J. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.

K. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

L. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

M. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

N. SSPC-SP 2 - Hand Tool Cleaning; 2024.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

C. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.

1.05 QUALITY ASSURANCE

A. Design miscellaneous steel and iron under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in Texas.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: Shapes, bar and plate shall conform to ASTM A 36/A 36M. Light gauge structural steel shall conform to ASTM A924, latest revision. All material shall be straight, free from mill scale, rust, pitting and dents that will detract from finished appearance when painted.

B. Steel Tubing: ASTM A500/A500M Grade C cold-formed structural tubing.

C. Plates: ASTM A283/A283M.

D. Pipe: ASTM A 53/A 53M, Grade B Schedule 40, black finish.

E. Slotted Channel Framing: ASTM A653/A653M, Grade 33.

F. Slotted Channel Fittings: ASTM A1011/A1011M.

G. Mechanical Fasteners: Same material as or compatible with materials being fastened; type consistent with design and specified quality level.

H. Sheet Metal shall be open hearth, full pickled, cold rolled, annealed, patent leveled, entirely free from scale, waves and other defects.

I. Bolts, Nuts, and Washers: ASTM F3125/F3125M, galvanized to ASTM A153/A153M where connecting galvanized components.

J. Rivets shall conform to ASTM A-141, latest revision.

K. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

L. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

M. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

A. All workmanship must be first-class in all respects and any members not presenting a finished and workmanlike appearance will be rejected. All finished members shall be free from twists, bends and open joints. Work shall conform to all applicable requirement of AISC.

B. All members shall be true to length so that assembly may be done without fillers, except where same are required as detailed. There shall be no projecting edges or corners where different members are assembled. On exposed surfaces, welds shall be ground smooth and flush with parent metal. All coping, blocking or mitering shall be done with care. Sharp edges and corners caused by shearing or other tooling shall be eased where exposed.

C. All details and connections shall be close fitting and carefully made and fitted, and special care shall be exercised to produce a thoroughly neat and workmanlike appearance. All detail pieces shall be made in exact accordance with Detail Drawings with all projecting corners clipped and all filler pieces made flush. Provide all lugs, clips, connections, bolts, etc., necessary to complete fabrication and erection.

D. Unless otherwise shown on Drawings, all bolts remaining in the finished, exposed work shall have countersunk heads; nuts shall be hexagonal. Bolts shall be of proper length to permit full thread in the nut, but shall not project more than 1/4" beyond the face of the nut. Screws shall be countersunk Phillips head.

E. The Contractor shall provide all holes in his work required for the connection of the work of other trades.

F. There shall be no flame cutting of members in the field without the consent of the Architect. If consent is given, burned flame cut members shall be finished to an acceptable appearance that shall be equal of a sheared finish.

G. Burning shapes to length in the shop with a standard flame cutting machine will be permitted. Burning of holes will NOT be permitted in the shop or in the field.

H. Anchors for frames, floor angles and other miscellaneous iron members shown anchored into concrete or masonry shall be strap iron, bent to shape, or deformed bent bars welded to backs of members, extended with bent end for building in as conditions required and of sizes and spacing as noted. Where the size and spacing are not noted, anchors shall not be less than 1-1/2" x 1/4" for concrete and 1-1/2" x 1/8" for masonry to fit the jointing of the adjacent brick or masonry block work. Unless otherwise noted on the Drawings, anchors shall be spaced 3'-0" or less o.c.

I. Where anchors and plates or clips are to be built in for attachment of later work, bolts shall be placed in the plates or clips and welded to back with threaded ends extended as required.

J. For attaching work to masonry or concrete, where anchors or inserts cannot be built-in, provide approved type of cinch anchors and machine bolts or screws. Holes shall be accurately drilled.

K. Fit and shop assemble items in largest practical sections, for delivery to site.

L. Fabricate items with joints tightly fitted and secured.

M. Continuously seal joined members by intermittent welds and plastic filler.

N. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

O. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

P. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FABRICATED ITEMS

A. Bollards: Steel pipe, concrete filled, prefabricated or hand formed crowned cap, or as detailed; prime paint finish "Safety Yellow" or as scheduled on the drawings.

B. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of metal decking, joists, and masonry; prime paint finish.

C. Lintels: As detailed; prime paint finish.

D. Door Frames for Overhead Door Openings and Wall Openings: Channel and Angle sections; prime paint finish.

E. Elevator Hoistway Divider Beams: Beam sections; prime paint finish.

2.04 UTILITY TRENCH, DRAINS AND CASTINGS

A. In fabricating items which will be exposed to view, limit materials to those which are free from surface blemishes, pitting, rolled trade names, and roughness.

B. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

C. Manufactures:
   1. J.R. Hoe: www.jrhoe.com.
   2. Neenah Foundry Company: www.nfco.com.
   3. Piedmont Pipe Manufacturing: www.piedmontpipe.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

D. Cast Iron Downspout Boots: Model and size to coordinate with downspout size specified, or approved equivalent, 3'-0" height. Coordinate model to accommodate discharge to below grade piping if present, otherwise provide discharge at grade. Provide boots at all locations where downspouts discharge at ground level or connect to below grade storm sewer piping.
   1. Downspout Boot Anchors: Hilti HY20 stainless steel threaded rod adhesive anchor system, or approved equivalent.

E. Provide 6 x 6 waterproof utility trench with 1/8" recessed cover to accept floor covering.

F. Provide 24 x 24 cast iron grate at elevator sump pits or size as indicated on the drawings.

2.05 FINISHES - STEEL

A. Prime paint steel items.
   1. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.

B. Prepare surfaces to be primed in accordance with SSPC-SP2.

C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

D. Prime Painting: One coat.

E. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft galvanized coating.

F. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

G. All steel exposed to weather, set in concrete shall be painted with cold galvanized zinc, specification of U.S. Navy MIL-P-21035, U.S. Air Force MIL-P-26915A, equal to Hot Dip galvanized in cathodic protection.

2.06 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 EXAMINATION

A. The Contractor shall examine the construction to which his work is to be applied and shall notify the Architect in writing if deficiencies exist which are detrimental to the proper and timely installation of any work required under this section.

3.02 PREPARATION

A. The contractor shall examine the drawings and specifications with respect to the work shown or required under this section and related sections so as to insure the completeness of all work. Supplementary parts necessary to complete each item of miscellaneous iron and steel required under this section, such as bent plates, beams, columns, sleeves, clips, brackets, hangers, anchors, bolts and other fastenings and supports, though such parts are not shown on drawings or specified herein, shall be included.

B. The Contractor shall coordinate and schedule the work of this section with the work of other trades. Anchors, sleeves, framing, fastenings and other miscellaneous items to be embedded in concrete or masonry or required for securing miscellaneous iron and steel work to other construction, shall be furnished as required and so as not to delay the progress of the work.

C. The Contractor shall obtain field measurements of adjoining work as required to locate and fit the work of this section. He will be held responsible for the accurate fitting of his material to the building.

D. Storage and Handling: Miscellaneous steel shall be handled and delivered to the job in a manner that will prevent damage to the material. Store in a dry place, under cover, well protected from weather and all elements that will cause deterioration.

E. Clean and strip primed steel items to bare metal where site welding is required.

F. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects. All parts shall be secured in a rigid and substantial manner and methods or attachment shall be concealed wherever practicable.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Field weld components as indicated.

D. Perform field welding in accordance with AWS D1.1/D1.1M.

E. Obtain approval prior to site cutting or making adjustments not scheduled.

F. After erection, prime welds, abrasionsand surfaces not shop primed or galvanized , except surfaces to be in contact with concrete.

G. Other trades will set and build in items of miscellaneous iron which are to be built into masonry or concrete, such as loose lintels, seat angles, door frames, curbs, sleeve inserts, brackets, lugs, anchors, etc. as required to complete all parts of the work.

H. All such items shall be fabricated and delivered by the miscellaneous iron trade, complete with bolts, anchors, clips, etc., ready for the other trades to set. This trade shall consult with the trades concerned and make delivery to the points designated by the latter to expedite the installation of delivered materials in their current locations and shall furnish setting drawings where required.

I. Where frames, curbs, and similar work are composed of several parts, only those parts upon which anchors occur will, unless otherwise specified, be set and built-in by the other trades ready to receive further field assembly by the miscellaneous iron contractor.

J. Where necessary to secure miscellaneous iron work to the structure by means of welding, expansion bolts, cinch anchors and similar connections, this trade shall, unless otherwise specified, do the work of laying out and installing such connections, installing the miscellaneous iron work and bolting up.

K. All other items of miscellaneous iron shall be furnished and completely installed and connections made by this trade.

L. Throughout the work of this trade, anchors and inserts shall be provided wherever possible for building in the adjoining work. Where lugs are shown or specified for building into adjoining masonry, the parts having lugs shall be erected in place before the masonry is built. Elsewhere, the work shall be brought to the building in as large pieces as practicable and attached to anchors or inserts during erection.

M. All parts of work exposed to view shall be left clean, smooth and neatly finished.

N. All freestanding steel handrails shall be embedded in the concrete slab unless noted otherwise.

O. Shelf angles and supports for masonry, etc., and slab edge plates shall be furnished and installed as shown.

P. All shelf angles shall be punched for bolts. Furnish and install bolts as required.

3.04 WELDING

A. All welding on steel, both shop and field, shall be done by the electric method in accordance with the American Welding Society specifications. Welder shall be especially skilled in this class of work and qualified by successfully passing the American Welding Society tests and have a current certificate.

B. Welds shall be solid and homogeneously a part of the metals joined and free from pits or incorporated slag and scale. Surfaces of welds shall be smooth and regular and shall be full area indicated or required to develop the required strength of the joints. Where exposed, welds shall be ground smooth and flush with the parent metal, so as to be imperceptible after painting.

C. If directed by Architect, welds, selected at random, shall be tested by an approved laboratory and any welds not complying with the specifications shall be removed and replaced with satisfactory work. The cost of test shall be borne by the Contractor in all cases in which welding fails to comply with the specifications, otherwise by Owner. The cost of replacing condemned welds, plus the cost of replacing other materials damaged incidental thereto, shall be borne by the Contractor.

D. Galvaweld: All welds on galvanized surfaces performed after galvanizing shall be Galvaweld coated.

3.05 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 05 5100
METAL STAIRS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Stairs with concrete treads.

B. Structural steel stair framing and supports.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Placement of metal anchors in concrete.

B. Section 04 2000 - Unit Masonry: Placement of metal fabrications in masonry.

C. Section 05 5000 - Metal Fabrications.

1.03 REFERENCE STANDARDS

A. AISC 207 - Standard for Certification Programs; 2025.

B. ASTM A6/A6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling; 2017.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

E. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

F. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

G. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2013.

H. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2021.

I. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.

J. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

K. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2021.

L. 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; 2018a.

M. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2019, with Editorial Revision (2020).

N. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.

O. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

P. SSPC-SP 2 - Hand Tool Cleaning; 2024.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
   2. Include the design engineer's seal and signature on each sheet of shop drawings.
   3. Shop drawing sheets that include engineering information designed by the Contractor's Delegated Design Engineer shall be signed and sealed in accordance with the Texas Engineering Practice Act. Sheets that do not provide information designed by the Contractor's Engineer do not require being signed and sealed. Calculation packages require a signed and sealed cover sheet only. Any submittals requiring to be signed and sealed that are received without the signature and seal will be rejected without review.

C. Design Data: As required by authorities having jurisdiction.

D. Welders' Certificates.

E. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is certified under AISC 207.

1.05 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in Texas, or personnel under direct supervision of such an engineer.

B. Welder Qualifications: Show certification of welders employed on the Work, verifying AWS qualification within the previous 12 months.

C. Fabricator Qualifications:
   1. A qualified steel fabricator that is certified by the American Institute for Steel Construction (AISC) under AISC 207.

PART 2 PRODUCTS

2.01 METAL STAIRS - GENERAL

A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.
   1. Handrails: Comply with applicable accessibility requirements of ADA Standards.
   2. Structural Design: Provide complete stair and railing assemblies complying with the applicable local code.
   3. Dimensions: As indicated on drawings.
   4. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
   5. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
   6. Separate dissimilar metals using paint or permanent tape.

B. Metal Jointing and Finish Quality Levels:
   1. Commercial: Exposed joints as inconspicuous as possible, whether welded or mechanical; underside of stair not covered by soffit IS considered exposed to view.
      a. Welded Joints: Intermittently welded on back side, filled with body putty, and sanded smooth and flush.
      b. Welds Exposed to View: Ground smooth and flush.
      c. Mechanical Joints: Butted tight, flush, and hairline.
      d. Bolts Exposed to View: Countersunk flat or oval head bolts; no exposed nuts.
      e. Exposed Edges and Corners: Eased to small uniform radius.
      f. Metal Surfaces to be Painted: Sanded or ground smooth, suitable for satin or matte finish.

C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.

D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

2.02 METAL STAIRS WITH CONCRETE TREADS

A. Jointing and Finish Quality Level: Commercial, as defined above.

B. Risers: Closed.

C. Treads: Metal pan with field-installed concrete fill.
   1. Concrete Depth: 2 inches, minimum.
   2. Tread Pan Material: Steel sheet.
   3. Tread Pan Thickness: As required by design; 14 gage, 0.075 inch minimum. For lengths over 5'-6" use 12 gage. Where terrazzo is used as a finish on the treads provide 10 gauge risers for all tread lengths.
   4. Pan Anchorage to Stringers: Continuously welded, from top or bottom.
   5. Concrete Reinforcement: Welded wire mesh.
   6. Concrete Finish: Steel troweled.

D. Risers: Same material and thickness as tread pans.
   1. Riser/Nosing Profile: Sloped riser with rounded nosing as specified in Section 05 5516.

E. Stringers: Rolled steel channels, HSS members, and or as indicated on drawings.
   1. Stringer Depth: As indicated on drawings.

F. Landings: Same construction as treads, supported and reinforced as required to achieve design load capacity.

G. Railings: As specified in Section 05 5213 and/or Section 05 7000. Reference drawings for locations of each ytpe where required.

H. Finish: Shop- or factory-prime painted.

I. Under Side of Stair: Exposed to view, to be finished same as specified for other exposed to view surfaces.

2.03 MATERIALS

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A500/A500M or ASTM A501/A501M structural tubing, round and shapes as indicated.

C. Steel Plates: ASTM A6/A6M or ASTM A283/A283M.

D. Pipe: ASTM A53/A53M Grade B Schedule 40, black finish.

E. Ungalvanized Steel Sheet: Hot- or cold-rolled, except use cold-rolled where finished work will be exposed to view.
   1. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Designation CS (commercial steel).
   2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Designation CS (commercial steel).

F. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230 with G40/Z120 coating.

G. Concrete Fill: Type specified in Section 03 3000.

H. Concrete Reinforcement: Mesh type as detailed, galvanized.

2.04 ACCESSORIES

A. Steel Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, and galvanized to ASTM A153/A153M where connecting galvanized components.

B. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

C. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.05 SHOP FINISHING

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

B. Do not prime surfaces in direct contact with concrete or where field welding is required.

C. Prime Painting: Use specified shop- and touch-up primer.
   1. Preparation of Steel: In accordance with SSPC-SP 2 Hand Tool Cleaning.
   2. Number of Coats: One.

D. Galvanizing: Hot-dip galvanize to minimum requirements of ASTM A123/A123M.
   1. Touch up abraded areas after fabrication using specified touch-up primer for galvanized surfaces.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. When field welding is required, clean and strip primed steel items to bare metal.

B. Supply items required to be cast into concrete and embedded in masonry with setting templates.

3.03 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects.

B. Provide anchors, plates, angles, hangers, and struts required for connecting stairs to structure.

C. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

D. Provide welded field joints where specifically indicated on drawings. Perform field welding in accordance with AWS D1.1/D1.1M.

E. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.

F. Obtain approval prior to site cutting or creating adjustments not scheduled.

G. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

END OF SECTION

SECTION 05 5133
METAL LADDERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop-fabricated metal ladders.

B. Ladder safety systems.

1.02 RELATED REQUIREMENTS

A. Section 05 5000 - Metal Fabrications

B. Section 09 9000 - Painting and Coating

1.03 REFERENCE STANDARDS

A. 29 CFR 1910.23 - Ladders; Current Edition.

B. 29 CFR 1910.28 - Duty to have Fall Protection and Falling Object Protection; Current Edition.

C. 29 CFR 1910.29 - Fall Protection Systems and Falling Object Protection - Criteria and Practices; Current Edition.

D. 29 CFR 1910.140 - Personal fall protection systems; Current Edition.

E. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 2008 (Reaffirmed 2018).

F. ANSI/ASSP Z359.11 - Safety Requirements for Full Body Harnesses; 2021.

G. ANSI/ASSP Z359.12 - Connecting Components for Personal Fall Arrest Systems; 2019.

H. ANSI/ASSP Z359.16 - Safety Requirements for Climbing Ladder Fall Arrest Systems; 2016.

I. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

J. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

K. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

L. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

M. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2013.

N. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2021.

O. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2019, with Editorial Revision (2020).

P. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.

Q. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

R. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

S. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

T. SSPC-SP 2 - Hand Tool Cleaning; 2024.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's data sheets on each ladder safety system product to be used, including installation instructions.

C. Shop Drawings:
   1. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
   2. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

D. Certificate: Provide documentation that ladder safety system products of this section meet or exceed cited 29 CFR 1910.28, 29 CFR 1910.29, ANSI/ASSP Z359.16, and ANSI A14.3 requirements.

E. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.

1.05 QUALITY ASSURANCE

A. Design miscellaneous steel and iron under direct supervision of a Professional Engineer experienced in design of this work and licensed in Texas.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A500/A500M Grade B cold-formed structural tubing.

C. Plates: ASTM A283/A283M.

D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

E. Mechanical Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.

F. Bolts, Nuts, and Washers: ASTM F3125/F3125M, galvanized to ASTM A153/A153M where connecting galvanized components.

G. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

H. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

I. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Continuously seal joined members by intermittent welds and plastic filler.

D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FABRICATED LADDERS

A. Ladders: Steel; in compliance with ANSI A14.3; with mounting brackets and attachments; prime paint finish.
   1. Side Rails: 3/8 by 2 inches members spaced at 20 inches.
   2. Rungs: One inch diameter solid round bar spaced 12 inches on center.
   3. Space rungs 7 inches from wall surface.
   4. Comply with 29 CFR 1910.28 for fixed ladders that extend more than 24 feet above a lower level.
   5. Provide ladders at elevator pit, roof hatch, floor hatch and roof-to-roof ladders where noted on the drawings or where required by code.

2.04 LADDER SAFETY SYSTEMS

A. Ladder Safety System: Comply with 29 CFR 1910.28 (b)(9)(i-iv), 29 CFR 1910.29, 29 CFR 1926.1053, and Section 7 of ANSI A14.3; ladder safety system allows the worker to climb up and down using both hands; does not require the employee continuously, hold, push, or pull any part of the system while climbing.
   1. Install on new fixed ladders over 24 feet in height.
   2. Anchorage: Fixed ladder meeting requirements of 29 CFR 1910.23.
   3. Flexible Carrier: Fixed 3/8 inch diameter galvanized steel wire rope lifeline with shock absorber and top, bottom and intermediate supports.
   4. Rigid Carrier: Fixed galvanized steel U-shaped slotted track with top, bottom and intermediate supports.
   5. Fall Arrester: Stainless steel and aluminum manual pass-through carrier sleeve fall arrester; compatible with carrier.

B. Personal Fall Arrest System Components; 29 CFR 1910.140:
   1. Body Support: Full body harness meeting requirements of ANSI/ASSP Z359.11; equipped with front or hip D-rings for attachment to climbing ladder fall arrest system.
   2. Connecting Means: Connecting hardware, such as a locking carabiner, meeting requirements of ANSI/ASSP Z359.12; compatible with fall arrester and body support harness.

2.05 FINISHES - STEEL

A. Prime paint steel items.
   1. Do not prime surfaces in direct contact with concrete.
   2. Do not prime surfaces where field welding is required.

B. Prepare surfaces to be primed in accordance with SSPC-SP2.

C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

D. Prime Painting: One coat.

E. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft galvanized coating.

F. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.06 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

B. Confirm that the ladder structure to which the ladder safety system is installed is capable of withstanding the loads applied by the system in the event of a fall.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Install ladder safety system in accordance with manufacturer's instructions.

C. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

D. Field weld components as indicated.

E. Perform field welding in accordance with AWS D1.1/D1.1M.

F. Obtain approval prior to site cutting or making adjustments not scheduled.

G. After erection, prime welds, abrasions, and surfaces not shop primed , except surfaces to be in contact with concrete.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 05 5213
PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall mounted handrails.

B. Stair or ramp railings and guardrails.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Placement of anchors in concrete.

B. Section 04 2000 - Unit Masonry: Placement of anchors in masonry.

C. Section 05 5100 - Metal Stairs: Attachment plates for handrails specified in this section.

D. Section 09 9000 - Painting and Coating: Paint finish.

1.03 REFERENCE STANDARDS

A. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

B. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2021.

C. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

1.05 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in Texas, or personnel under direct supervision of such an engineer.

B. Welder Qualifications: Show certification of welders employed on the Work, verifying AWS qualification within the previous 12 months.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Handrails and Railings Accessories:
   1. C.R. Laurence Co., Inc., Blumcraft: www.crl-arch.com.
   2. Julius Blum & Company: www.juliusblum.com.
   3. The Wagner Companies, Braun: www.wagnercompanies.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Epoxy Grout:
   1. W.R. Meadows: EG-96 HP
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 RAILINGS - GENERAL REQUIREMENTS

A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of applicable local code.

B. Design railing assembly, wall rails, and attachments to resist the following forces at any point without damage or permanent set as required by OSHA, the Local Building Code and Texas Accessibility Standards. Test in accordance with ASTM E 935.
   1. Handrains and Gaurdrails: 50plf lateral force and a 200lb concentrated lateral force in any direction.

2. Grab Bars, Shower Seats, and Dressing Room Bench Seats: 250lb concentrated lateral force in any direction.

C. Allow for expansion and contraction of members and building movement without damage to connections or members.

D. Provide non-expansive epoxy grout (mounding up) all around and under each vertical pipe. No gypsum based grout allowed.

E. Handrail Dimensions: See drawings for configurations and heights.
1. Top Rails and Wall Rails: 1-1/2 inches diameter, round.
2. Intermediate Rails: 1-1/2 inches diameter, round.
3. Posts: 1-1/2 inches diameter, round at 4'-0" on center.
4. Balusters: 3/4 inch diameter, round.

F. Guardrail Dimensions: See drawings for configurations and heights.
1. Top Rails: 1-1/2 or 2 inches diameter, round. Reference drawing for configuration used.
2. Intermediate Rails: 1-1/2 inches diameter, round.
3. Posts: 1-1/2 or 2 inches diameter, round. Reference drawing for configuration used.
   a. 1-1/2" post shall be at 2'-0" on center.
   b. 2" post shall be at 4-0" on center.
4. Balusters: 3/4 inch diameter, round.

G. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
1. For anchorage to concrete, provide inserts to be cast into concrete, for bolting anchors.
2. For anchorage to masonry, provide brackets to be embedded in masonry, for bolting anchors.
3. For anchorage to stud walls, provide backing plates, for bolting anchors.
4. Posts: Provide adjustable flanged brackets.

H. Provide mechanical and welding fittings where indicated to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

2.03 STEEL RAILING SYSTEM

A. Steel Tube: ASTM A500/A500M Grade B cold-formed structural tubing.

B. Steel Pipe: ASTM A 53/A 53M, Grade B Schedule 40, black finish.

C. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.

D. Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.

E. Straight Splice Connectors: Steel concealed spigots.

F. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.04 STAINLESS STEEL HANDRAILS

A. Handrail:
1. 1-1/2 inch diameter stainless steel; No. 6 satin finish..
2. Internal Connection Sleeves: Sleeve, material compatible with handrail and top cap material.
3. Handrail Brackets: Manufacturer's standard stainless steel brackets.
   a. Mounting: Wall.
   b. Finish: No. 6 satin finish..
4. Comply with TAS and ADA Standards.

2.05 FABRICATION

A. Accurately form components to suit specific project conditions and for proper connection to building structure.

B. Fit and shop assemble components in largest practical sizes for delivery to site.

C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.

D. Welded Joints:
   1. Exterior Components: Continuously seal joined pieces by continuous welds. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
   2. Interior Components: Continuously seal joined pieces by continuous welds.
   3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply items required to be cast into concrete, embedded in masonry, or placed in partitions with setting templates, for installation as work of other sections.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.

C. Anchor railings securely to structure.

D. At each vertical post set in concrete cores, provide non-expansive epoxy grout. No gypsum based grout allowed.

E. Field weld anchors as indicated on drawings. Touch-up welds with primer. Grind welds smooth.

F. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/8 inch per floor level, non-cumulative.

B. Maximum Offset From True Alignment: 1/8 inch.

C. Maximum Out-of-Position: 1/8 inch.

END OF SECTION

SECTION 05 5516
METAL STAIR NOSINGS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Interior Cast-in-Place Stair Nosings

B. Exterior Cast-in-Place Stair Nosings

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete

B. Section 05 5100 - Metal Stairs

1.03 REFERENCE STANDARDS

A. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes

B. ADAAG, Americans with Disabilities Act Accessibility Guidelines.

C. TAS, Texas Accessibility Standards

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product data: Within 15 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
   1. Materials list of items proposed to be provided under this Section;
   2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
   3. Shop Drawings in sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with the work of adjacent trades; including color samples.
   4. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.05 QUALITY ASSURANCE

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

C. Perform shop and/or field welding required in connection with the work of this Section in strict accordance with pertinent recommendations of the American Welding Society.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01 6000 - Product Requirements.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a one year period after Date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. American Safety Tread Company: www.americansafetytread.com

B. Babcock-Davis: www.babcockdavis.com.

C. Balco, Inc.: www.balcousa.com

D. Nystrom, Inc.: www.nystrom.com.

E. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Cast-in-Place Interior Stair Nosings

1. At interior locations of concrete filled steel stair pans, stair nosings shall be a two part system, equal to type DST-330 (Type 1 Anchor) as manufactured by Balco, Inc. The base shall consist of heat treated extruded aluminum alloy 6063-T5. The abrasive filler shall consist of a mixture of aluminum oxide and silicon carbide granules in an epoxy matrix locked into the extruded channels of the base. The abrasive ribs shall project a minimum of 1/16 inch above the extruded channels. Nosings shall be full length of steps. Color shall be as selected by the architect.

B. Exterior locations

1. At exterior locations of concrete stairs, nosings shall be a two part system, equal to type XH-330 (Type 1 Anchor) as manufactured by Balco, Inc. The base shall consist of heat treated extruded aluminum alloy 6063-T5. The abrasive filler shall consist of a mixture of aluminum oxide and silicon carbide granules in an epoxy matrix locked into the extruded channels of the base. Nosings shall terminate not more than 1" from ends of steps for poured concrete stairs. Color shall be as selected by the architect.

2.03 ACCESSORIES

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

2.04 FABRICATION

A. Except as otherwise shown on the Drawings or the approved Shop Drawings, use materials of size, thickness, and type required to produce reasonable strength and durability in the work of this Section.

B. Fabricate with accurate angles and surfaces which are true to the required lines and levels, grinding exposed welds smooth and flush, forming exposed connections with hairline joints, and using concealed fasteners wherever possible.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine the area and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

3.02 INSTALLATION

A. General

1. Set work accurately into position, plumb, level, true and free from rack.
2. Anchor firmly into position.
3. Where field welding is required, comply with AWS recommended procedures of manual-shielded metal-arc welding for appearance and quality of weld and for methods to be used in correcting welding work.
4. Grind exposed welds smooth and touch-up shop prime coats.
5. Do not cut, weld, or abrade surfaces which have been hot-dip galvanized after fabrication and which are intended for bolted or screwed field connections.

3.03 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

3.04 PROTECTION

A. Protect installed Ladders from subsequent construction operations.

3.05 MAINTENANCE

A. See Section 01 7000 - Execution Requirements, for additional requirements relating to maintenance service.

END OF SECTION

SECTION 05 7000
DECORATIVE METAL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Railing and guardrail assemblies.

B. Wall-mounted handrails.

C. Free-standing railings at steps.

1.02 RELATED REQUIREMENTS

A. Section 05 5000 - Metal Fabrications: Supports.

B. Section 05 5100 - Metal Stairs: Handrails other than those specified in this section.

C. Section 09 2116 - Gypsum Board Assemblies: Placement of backing plates in stud wall construction.

1.03 REFERENCE STANDARDS

A. 2012 TAS - Texas Accessibility Standards; 2012.

B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

C. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2017.

D. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014 (Editorial 2017).

E. ASTM A554 - Standard Specification for Welded Stainless Steel Mechanical Tubing; 2016.

F. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

G. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2020.

H. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2019.

I. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2013, with Editorial Revision.

J. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Meeting: Schedule and conduct a preinstallation meeting one week before starting work of this section. Attendees shall include, but not be limited to:
   1. Contractor.
   2. Manufacturer's representative.
   3. Architect.
   4. Other subcontractors of adjacent work.

1.05 SUBMITTALS

A. Product Data: Submit manufacturer's product data including description of materials, components, finishes, fabrication details, glass, anchors, and accessories.

B. Shop Drawings: Indicate railing system elevations and sections, details of profile, dimensions, sizes, connection attachments, anchorage, size and type of fasteners, and accessories. Indicate anchor and joint locations, brazed connections, transitions, and terminations.

C. Test Reports: Submit test reports from an independent testing agency showing compliance with specified design and performance requirements.

D. Manufacturer's Installation Instructions.

E. Maintenance Data: Manufacturer's instructions for care and cleaning.

F. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Design railing system under direct supervision of a Professional Engineer experienced in design of this work and licensed in Texas.

B. Installer Qualifications: Company specializing in installing decorative stairs and railing systems and acceptable to manufacturer.

C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with not less than three years of experience.

D. Templates: Supply installation templates, reinforcing and required anchorage devices.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect materials against damage during transit, delivery, storage, and installation at site.

B. Inspect materials upon delivery for damage. Repair damage to be indistinguishable from undamaged areas; if damage cannot be repaired to be indistinguishable from undamaged parts and finishes, replace damaged items.

1.08 FIELD CONDITIONS

A. Do not install railings until project is enclosed and ambient temperature of space is minimum 65 degrees F and maximum 95 degrees F.

B. Maintain ambient temperature of space at minimum 65 degrees F and maximum 95 degrees F for 24 hours before, during, and after railing installation.

1.09 WARRANTY

A. Warranty: Manufacturer's standard one year warranty against defects in materials, fabrication, finishes, and installation commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.01 RAILING SYSTEMS

A. Railing Systems - General: Factory- or shop-fabricated in design indicated, to suit specific project conditions, and for proper connection to building structure, and in largest practical sizes for delivery to site.
   1. Performance Requirements: Design and fabricate railings and anchorages to resist the following loads without failure, damage, or permanent set; loads do not need to be applied simultaneously.
      a. Lateral Force: 75 lb minimum, at any point, when tested in accordance with ASTM E935.
      b. Distributed Load: 50 lb/ft minimum, applied in any direction at the top of the handrail, when tested in accordance with ASTM E935.
      c. Concentrated Loads on Intermediate Rails: 50 psf, minimum.
      d. Concentrated Load: 200 lbs minimum, applied in any direction at any point along the handrail system, when tested in accordance with ASTM E935.
      e. Handrails: Comply with applicable accessibility requirements of 2012 TAS and 2010 ADA Standards.
   2. Assembly: Join lengths, seal open ends, and conceal exposed mounting bolts and nuts using slip-on non-weld mechanical fittings, flanges, escutcheons, and wall brackets.
   3. Joints: Tightly fitted and secured, machined smooth with hairline seams.
   4. Field Connections: Provide sleeves to accommodate site assembly and installation.

B. Metal Railing: Engineered, post-supported railing system with metal infill.
   1. Configuration: Guardrail with separate handrail.

2. Top Rail: 2 inch diameter pipe or tube.
3. Grip Rail: Round, stainless steel, 1-1/2 inch diameter.
4. Decorative Flanges for Embedded Posts: Circular, collared cover plate without screw holes.
5. Wall Mounted Components: Components necessary to support railing with 1-1/2 inch clearance from wall, and as follows:
   a. Underslung support brackets: Supports at 60 inches, maximum.
   b. Wall return without support: Terminates 1/4 inch from side wall.
6. Handrail Brackets: Same metal as railing.
7. Fasteners: Concealed.
8. Infill at Glass Railings: Glass Panels
   a. Glass: As specified in this section.
   b. Handrail Brackets: Same metal as railing.
9. End and Intermediate Posts: Same material and size as top rails.
   a. Horizontal Spacing: As indicated on drawings.
   b. Mounting: Welded.

C. Wall-Mounted Handrail:
1. 1-1/2 inch diameter stainless steel; No. 6 satin finish..
2. Internal Connection Sleeves: Sleeve, material compatible with handrail and top cap material.
3. Handrail Brackets: Manufacturer's standard stainless steel brackets.
   a. Mounting: Wall.
   b. Finish: No. 6 satin finish..
4. Comply with TAS and ADA Standards.

2.02 MATERIALS

A. Stainless Steel Components:
1. ASTM A666/A666M, Type 304.
2. Stainless Steel Tubing: ASTM A554, Type 304, 16 gage, 0.0625 inch minimum metal thickness, 1-1/2 inch diameter.
3. Stainless Steel Bars, Shapes and Moldings: ASTM A276/A276M, Type 304.
4. Stainless Steel Finish: No. 6 satin finish..

B. Glass: Laminated safety glass; ASTM C1172, unless otherwise indicated.
1. Plastic Interlayer: Minimum 0.060 inch thick.
2. Impact Strength: Category II, tested in accordance with 16 CFR 1201.
3. Thickness: 1/2 inch.
4. Configuration: As indicated on drawings.
5. Edges: Ground smooth and polished.
6. Color: Clear, no tint.
   a. Provide frosted or etched glass where shown on the drawings.

2.03 ACCESSORIES

A. Non-Weld Mechanical Fittings for Stainless Steel Railings: Slip-on, galvanized malleable iron castings, for Schedule 40 pipe, with flush setscrews for tightening by standard hex wrench, no bolts or screw fasteners.

B. Anchors and Fasteners: Provide anchors and other materials as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
1. Exposed Fasteners: No exposed bolts or screws.

C. Carbon Steel Bolts and Nuts: ASTM A307.

D. Sealant: Silicone; clear.

E. Finish Touch-Up Materials: As recommended by manufacturer for field application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate and site conditions are acceptable and ready to receive work.

B. Verify field dimensions of locations and areas to receive work.

C. Notify Architect immediately of conditions that would prevent satisfactory installation.

D. Do not proceed with work until detrimental conditions have been corrected.

3.02 PREPARATION

A. Protect existing work.

B. Clean surfaces to receive units. Remove materials and substances detrimental to the installation.

3.03 INSTALLATION

A. Comply with manufacturer's drawings and written instructions.

B. Anchor securely to structure.

C. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

D. Weld connections that cannot be shop welded due to size limitations.
   1. Weld in accordance with AWS D1.1/D1.1M.
   2. Match shop welding and bolting.
   3. Repair galvanizing with galvanizing repair paint per ASTM A780/A780M.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

3.05 FIELD QUALITY CONTROL

A. Field Services: Provide the services of the manufacturer for field observation of installation of railings.

3.06 CLEANING

A. Remove protective film from exposed metal surfaces.

B. Glass and Glazing: Clean glazing surfaces; remove excess glazing sealant compounds, dirt, and other substances.

3.07 PROTECTION

A. Protect installed components and finishes from damage after installation.

B. Repair damage to exposed finishes to be indistinguishable from undamaged areas.
   1. If damage to finishes and components cannot be repaired to be indistinguishable from undamaged finishes and components, replace damaged items.

END OF SECTION

SECTION 06 1000
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-structural dimension lumber framing.
B. Structural Composite Lumber
C. Sheathing.
D. Roofing nailers.
E. Roofing cant strips.
F. Preservative treated wood materials.
G. Fire retardant treated wood materials.
H. Miscellaneous framing and sheathing.
I. Concealed wood blocking, nailers, and supports.
J. Miscellaneous wood nailers, furring, and grounds.

1.02 RELATED REQUIREMENTS

A. Section 05 1200 - Structural Steel Framing: Prefabricated beams and columns for support of wood framing.
B. Section 05 5000 - Metal Fabrications: Miscellaneous steel connectors and support angles for wood framing.
C. Section 07 7200 - Roof Accessories: Prefabricated roof curbs.

1.03 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
C. ASTM D2898 - Standard Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing; 2010 (Reapproved 2017).
D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023.
E. AWPA U1 - Use Category System: User Specification for Treated Wood; 2022.
F. PS 1 - Structural Plywood; 2019.
G. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; 2010.
H. PS 20 - American Softwood Lumber Standard; 2020.
I. SPIB (GR) - Grading Rules; 2014.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide technical data on insulated sheathing, wood preservative materials, application instructions, and vendor.
C. Structural Composite Lumber: Submit manufacturer's published structural data including span tables, marked to indicate which sizes and grades are being used; if structural composite lumber is being substituted for dimension lumber or timbers, submit grading agency structural tables marked for comparison.

D. Samples: For rough carpentry members that will be exposed to view, submit three samples, 12by12 inch in size illustrating wood grain, color, and general appearance.

E. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.
   1. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.
   2. Identify plywood sheathing as to grade, use, span rating and exposure classification by the mark of the APA The Engineered Wood Association.
   3. Use extreme care when off-loading lumber to prevent damage, splitting and breaking of materials. Split or broken plywood sheathing will not be accepted for use in the work of this Section.

B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
   1. Species: Spruce-Pine-Fir (South), unless otherwise indicated.
   2. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
   3. Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.

2.02 DIMENSION LUMBER

A. Grading Agency: Southern Pine Inspection Bureau, Inc; SPIB (GR).

B. Sizes: Nominal sizes as indicated on drawings, S4S.

C. Moisture Content: 19 percent maximum.

D. Stud Framing (2 by 2 through 2 by 6):
   1. Species: Any allowed under referenced grading rules.
   2. Grade: No. 2.

E. Joist and Rafter Framing (2 by 6 through 4 by 16):
   1. Species: Spruce-Pine-Fir (South).
   2. Grade: No. 2.

F. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Lumber: S4S, No. 2 or Standard Grade.
   2. Boards: No. 2 or Standard Grade.

2.03 STRUCTURAL COMPOSITE LUMBER

A. System Description
   1. Design Requirements: Design gate system to withstand Miami/Dade County 110 MPH steady wind and 130 MPH gusting wind tests.

B. Warranties
   1. Furnish manufacturer's 10-year warranty providing coverage against checking, splitting, splintering, rotting, structural damage from termites and fungal decay of composite wood.

C. Materials
   1. Composite Wood:
      a. Reclaimed wood and plastic with integral coloring; free from toxic chemicals and preservatives.

D. Components
   1. Gate System: as detailed on the drawings.
      a. Components:
         1) Pickets
         2) Top and bottom rails.
         3) Bottom rail inserts.
      b. Surface texture: Smooth.
      c. Color: as selected by Architect.

E. Accessories
   1. Fasteners: Galvanized or corrosion-resistant coated steel.
   2. Provide stainless steel where used at fire retardant or pressure treated wood.

F. Manufacturers:
   1. Trex Company: www.trex.com
   2. iLevel by Weyerhaeuser: www.ilevel.com.
   3. Boise Cascade: www.bc.com.
   4. Georgia-Pacific Corp.: www.gp.com.
   5. Substitutions: See Section 01 6000 - Product Requirements.

2.04 EXPOSED BOARDS

A. Submit manufacturer's certificate that products meet or exceed specified requirements, in lieu of grade stamping.

B. Moisture Content: S-dry (19 percent maximum).

C. Surfacing: S4S.

D. Species: Douglas Fir.

E. Grade: No. 2, 2 Common, or Construction.

2.05 CONSTRUCTION PANELS

A. Roof Sheathing: Any PS 2 type, rated Structural I Sheathing.
   1. Bond Classification: Exposure 1.
   2. Span Rating: 40/20.
   3. Thickness: 5/8 inch, nominal for standing seam metal roofs, 2 layers of 3/8 inch, nominal for curved standing seam metal roofs and 3/4 inch for asphalt shingle roofs.
   4. Provide metal clip supports between sheets

B. Other Applications: Thickness as noted on the drawings
   1. Plywood Concealed From View But Located Within Exterior Enclosure: PS 1, C-C Plugged or better, Exterior grade.
   2. Plywood Exposed to View But Not Exposed to Weather: PS 1, A-D, or better.
   3. Other Locations: PS 1, C-D Plugged or better.

2.06 ACCESSORIES

A. Fasteners and Anchors:
   1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, stainless steel for fire retardant treated locations, unfinished steel elsewhere.
   2. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.

3. Anchors: Expansion shield and lag bolt type for anchorage to solid masonry or concrete.

B. Fasteners at Roof Nailers:
   1. Wood Substrate: #10 stainless steel flat head screws, length as necessary to penetrate underlying wood support members a minimum of 1 1/4 inch. Each fastener to have a minimum pull out resistance of 100 pounds.
      a. Bent plate for attaching vertical lumber at curbs: 18 gauge galvanized steel (G90) bent plate, fastened with stainless steel pancake head screws.
   2. Metal Substrate: No. 12 Factory Mutual approved, fluorocarbon coated roofing screw.
   3. Concrete or masonry surfaces: Series 400 stainless steel anchor with expansion shank, length as recommended by manufacturer for minimum 1,000 pound pull-out resistance.
   4. Lightweight Fill Substrate: OMG Lite-Deck Fasteners (or approved equivalent) #TSFQ4, minimum length sufficient to provide manufacturer’s minimum embedment into substrate for published resistances.
      a. Shank diameter 0.312” minimum, thread diameter of 0.375” minimum.
      b. Fastener shall be coated with a corrosion resistant coating. When subjected to 30 Kesternich cycles (DIN 50018),the fastener must show less than 15% red rust and surpass Factory Mutual Approval Standard 4470.

C. Die-Stamped Connectors: Hot dipped galvanized steel, sized to suit framing conditions.
   1. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.

D. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions.
   1. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.

E. Air and Water Barrier as specified in Section 07 2700.

2.07 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
   1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
   2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Fire-Retardant Treatment:
   1. Exterior Type: AWPA U1, Category UCFB, Commodity Specification H, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898.
      a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
      b. Treat all exterior rough carpentry items.
      c. Do not use treated wood in direct contact with the ground.
   2. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
      a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.

b. Treat rough carpentry items as indicated .
c. Treat lumber in contact with roofing, flashing, or waterproofing.
d. Do not use treated wood in applications exposed to weather or where the wood may become wet.

C. Preservative Treatment:
1. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
b. Treat lumber exposed to weather.
c. Treat lumber in contact with masonry or concrete.
d. Treat lumber in other locations as indicated.
2. Preservative Pressure Treatment of Plywood Above Grade: AWPA U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative.
a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.
b. Treat plywood in contact with masonry or concrete.
c. Treat plywood in other locations as indicated.
3. Preservative Pressure Treatment of Lumber in Contact with Soil: AWPA U1, Use Category UC4A, Commodity Specification A using waterborne preservative.
a. Preservative for Field Application to Cut Surfaces: As recommended by manufacturer of factory treatment chemicals for brush-application in the field.
b. Restrictions: Do not use lumber or plywood treated with chromated copper arsenate (CCA) in exposed exterior applications subject to leaching.
4. Preservative Pressure Treated plywood or lumber in contact with roofing, flashing or waterproofing is not permitted

PART 3 EXECUTION

3.01 PREPARATION

A. Where wood framing bears on cementitious foundations, install full width sill flashing continuous over top of foundation, lap ends of flashing minimum of 4 inches and seal.

B. Install sill gasket under sill plate of framed walls bearing on foundations; puncture gasket cleanly to fit tightly around protruding anchor bolts.

C. Coordinate installation of rough carpentry members specified in other sections.

3.02 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 FRAMING INSTALLATION

A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength.

B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.

C. Install structural members full length without splices.

D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes.

E. Install horizontal spanning members with crown edge up and not less than 3 inches of bearing at each end.

F. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.

G. Provide bridging at joists in excess of 8 feet span at mid-span. Fit solid blocking at ends of members.

H. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.04 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.

C. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

D. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

E. Provide the following specific non-structural framing and blocking:
1. Cabinets and shelf supports.
2. Wall brackets.
3. Handrails.
4. Grab bars.
5. Towel and bath accessories.
6. Wall-mounted door stops.
7. Chalkboards and marker boards.
8. Wall paneling and trim.
9. Joints of rigid wall coverings that occur between studs.

3.05 ROOF-RELATED CARPENTRY

A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

B. Provide fire-retardant treated wood curb at all roof openings except where prefabricated curbs are specified and where specifically indicated otherwise. Form corners by alternating lapping side members.
1. Install new fire-retardant treated wood where indicated to provide total height of a minimum of 12 inches above the finished roof surface, allowing for height of insulation system, crickets, and coverboard, as applicable.
2. Fasten securely to substrate.
3. Fire treat surfaces exposed by cutting as recommended by preservative manufacturer.
4. Fasten fire-retardant treated wood curb to nailer prior to installation with appropriate wood nailer fastener on 12-inch centers.

C. Secure all roof nailers at copings and edges with two staggered rows of fasteners, spaced 12" o.c. maximum at wood or light gauge steel substrates, and 24" o.c. maximum at concrete, grouted masonry, or structural steel substrates.

3.06 INSTALLATION OF CONSTRUCTION PANELS

A. General: Comply with applicable recommendations contained in APA Form No. E30, "APA Design/Construction Guide: Residential & Commercial," for types of structural-use panels and applications indicated.
   1. Comply with "Code Plus" provisions of above-referenced guide.

B. Comply with system manufacturer's written instructions for installing plywood.
   1. Install plywood sheathing continuously, with the strength of the axis of the panel across supports. Plywood sheathing shall be installed with offset joints. Butt end joints over supports, providing a space of 1/16" at panel ends and 1/8" at panel edges.
   2. Fasten each layer of plywood sheathing using #13-14 Dekfast screws with Phillips drive truss heads in a noncorrosive base material in sufficient length to penetrate the metal decking by 1/2". Use a screw pattern of 6" spacing along exterior edges and a 12" interior grid pattern per UL90 class 580 uplift. Provide a minimum of 32 fasteners per sheet. Plywood shall be fastened as an independent system for the insulation. Where drawings indicate multiple layers of plywood, stagger second layer in both directions from pattern below. At curved roof structures, plywood shall conform to the radius of the structure.
   3. Within 40 feet in any direction of any 4-hour firewall, install fire-retardant treated plywood sheathing.
   4. Provide metal clip supports between sheets at center spans unless tongue and groove plywood sheathing is used.
   5. Cover plywood sheathing as soon as possible with specified underlayment for protection against excessive moisture prior to roofing application.
   6. Do not install plywood sheathing in adverse weather conditions. Plywood sheathing may be rejected by the Architect, whether or not it has been installed, for excessive warp, twist, crook, mildew, fungus, or mold as well as for improper curing and firming prior to installation. Wet or damaged plywood sheathing will be rejected.

3.07 SITE APPLIED WOOD TREATMENT

A. Apply preservative treatment compatible with factory applied treatment at site-sawn cuts, complying with manufacturer's instructions.

B. Allow preservative to dry prior to erecting members.

3.08 TOLERANCES

A. Framing Members: 1/8 inch from true position, maximum.

B. Surface Flatness of Floor: 1/8 inch in 10 feet maximum, and 3/8 inch in 30 feet maximum.

C. Variation from Plane (Other than Floors): 1/8 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.09 CLEANING

A. Waste Disposal: Comply with the requirements of Section 01 7000.
   1. Comply with applicable regulations.
   2. Do not burn scrap on project site.

B. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 06 2000
FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Finish carpentry items.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Support framing, grounds, and concealed blocking.

B. Section 08 1416 - Flush Wood Doors.

C. Section 09 9000 - Painting and Coating: Painting and finishing of finish carpentry items.

1.03 REFERENCE STANDARDS

A. ANSI A135.4 - Basic Hardboard; 2012 (Reaffirmed 2020).

B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 4.0; 2021.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with plumbing rough-in, electrical rough-in, and installation of associated and adjacent components.

B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data:
   1. Provide data on fire retardant treatment materials and application instructions.
   2. Provide instructions for finish hardware.

C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
   1. Scale of Drawings: 1-1/2 inch to 1 foot, minimum.
   2. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).

D. Samples: Submit two samples of finish plywood, 6 by 6 inch in size illustrating wood grain and specified finish.

E. Samples: Submit two samples of wood trim 6 inches long.

1.06 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
   1. Company with at least one project within the past 5 years with value of woodwork within 20 percent of cost of woodwork for this project.
   2. Single Source Responsibility: Provide and install this work from single fabricator.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-fabricated units to project site in original packages, containers or bundles bearing brand name and identification.

B. Store finish carpentry items under cover, elevated above grade, and in a dry, well-ventilated area not exposed to heat or sunlight.

C. Protect from moisture damage.

D. Handle materials and products to prevent damage to edges, ends, or surfaces.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

A. Quality Standard: Premium Grade, in accordance with AWI/AWMAC/WI (AWS), unless noted otherwise.

B. Surface Burning Characteristics: Provide materials having fire and smoke properties as required by applicable code.

C. Interior Woodwork Items:
   1. Moldings, Bases, Casings, and Miscellaneous Trim: As detailed on the drawings.

2.02 LUMBER MATERIALS

A. Hardwood Lumber: As noted on the drawings, with a maximum moisture content of 6 percent, of quality suitable for transparent finish.

2.03 SHEET MATERIALS

A. Hardwood Plywood: Face species as indicated, plain sawn, book matched, veneer core, glue type as recommended for application.

B. Hardboard: ANSI A135.4; Pressed wood fiber with resin binder, Class 1 - Tempered, 1/4 inch thick, smooth one side (S1S).

C. Pegboard: Pressed wood fiber with resin binder, standard grade; 1/4 inch thick, with holes spaced at 1 inch on center in both directions.

D. Solid Surfacing: For Solid Surfacing Countertops, Sills and where called out on the drawings, see Section 12 3600-Countertops.

2.04 FASTENINGS

A. Adhesive for Purposes Other Than Laminate Installation: Suitable for the purpose; not containing formaldehyde or other volatile organic compounds.

B. Fastening:
   1. Install items straight, true, level, plumb, and firmly anchored in place.
   2. Where blocking or backing is required, coordinate as necessary with other trades to ensure placement of required backing and blocking in a timely manner.
   3. Nail trim with finish nails of proper dimension to hold the member firmly in place without splitting the wood.
   4. Nail exterior trim with galvanized nails, making joints to exclude water and setting in waterproof glue or the sealant described in Section 07 9200 - Joint Sealants of these Specifications.

2.05 FINISHING

A. Sand work smooth and set exposed nails and screws.

B. Apply wood filler in exposed nail and screw indentations.

C. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.

D. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and Section 09 9000-Painting and Coating.

E. Back prime woodwork items to be field finished, prior to installation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.02 INSTALLATION

A. Install work in accordance with AWI/AWMAC/WI (AWS) requirements for grade indicated.

B. Set and secure materials and components in place, plumb and level.

C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

D. Install components with nails at 8 inch on center.

3.03 PREPARATION FOR SITE FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

B. Site Finishing: See Section 09 9000.

C. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

3.04 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

SECTION 06 6400
TRANSLUCENT RESIN PANEL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Translucent Resin Panel Systems

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification sections, apply to this Section.

1.03 SUBMITTALS

A. General: Submit the following in accordance with conditions of contact and Division 1 specification section 01 3000-Administrative Requirements.

B. Product Data: Submit manufacturer's product data; include product description, fabrication information, and compliance with specified performance requirements.

C. Submit product test reports from a qualified independent 3rd party testing agency indicating each type and class of panel system complies with the project performance requirements, based on comprehensive testing of current products. Previously completed test reports will be acceptable if for current manufacturer and indicative of products used on this project.
   1. Test reports required are:
      a. Rate of Burning (ASTM D 635)
      b. Self-Ignition Temperature (ASTM D 1929)
      c. Density of Smoke (ASTM D 2843)
      d. Flame spread and Smoke developed testing (ASTM E 84)
      e. Room Corner Burn Test (NFPA 286)
      f. Extent of Burning (UL 94)
      g. Impact strength (ASTM D 3763)
      h. Safety glazing impact resistance (ANSI Z97.1-2004)
      i. UPITT Test for Combustion Product Toxicity
      j. Dynamic environmental testing (ASTM standards D 5116 and D 6670)

D. Shop Drawings: Include plans, elevations, sections, panel dimensions, details, and attachments to other work.

E. Samples for Initial Selection:
   1. Submit minimum 2-inch by 2-inch samples. Indicate full color, texture and pattern variation.

F. Samples for Verification:
   1. Submit minimum 4-inch by 4-inch sample for each type, texture, pattern and color of solid plastic fabrication.

G. Mockups:
   1. Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects.
   2. Build mockup of each type of Plastic Fabrication.
   3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

H. Maintenance Data: Submit manufacturer's care and maintenance data, including care, repair and cleaning instructions. Include in Project closeout documents.

1.04 QUALITY ASSURANCE

A. Manufacturers Qualifications

1. Materials and systems shall be manufactured by a company continuously and regularly employed in the manufacture of specified materials for a period of at least five (5) consecutive years and which can show evidence of those materials being satisfactorily used on at least six (6) projects of similar size, scope and location. At least three (3) of the projects shall have been successful for use five (5) years or longer.
2. Manufactured panels must be produced from a minimum of 40% post-industrial recycle content. This recycle content must be certified by a recognized 3rd party certification group, such as Scientific Certification Systems (SCS).
3. Manufacturer must offer a documented reclaim process that will take back, at the manufacturers cost, panels that are at their end-of life cycle. Return process is preceded by following requirements highlighted in Section 02 42 00 Removal and Salvage of Construction Materials.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver Plastic Fabrications, systems and specified items in manufacturer's standard protective packaging.

B. Do not deliver Plastic Fabrications, system, components and accessories to Project site until areas are ready for installation.

C. Store materials in a flat orientation in a dry place that is not exposed to exterior elements.

D. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent damage or staining following installation for duration of project.

E. Before installing Plastic Fabrications, permit them to reach room temperature.

1.06 PROJECT CONDITIONS

A. Environmental Limitations: Do not install Solid Polymer Fabrications until spaces are enclosed and weatherproof, and ambient temperatures and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.07 WARRANTY

A. Manufacturer's Special Warranty on Plastic Fabrications: Manufacturer's standard form agreeing to repair or replace units that fail in material or workmanship within the specified warranty period.

B. Warranty Period: 2 year after the date of substantial completion.

C. The warranty shall not deprive the owner of other rights or remedies the Owner may have under other provisions of the Contract Documents, and is in addition to and runs concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. 3form, Inc.: www.3-form.com.

B. Lumicor: www.lumicor.com.

C. Substitutions: See Section 01 6000 – Product Requirements.

2.02 MATERIALS

A. Refer to Schedule of Materials on the drawings for specific product line and color.
   1. Engineered polyester resin
   2. Sheet Size: As scheduled.
   3. Thickness: Minimum 3/8" or 1/2". See drawings for locations.

B. Interlayer Materials: Compatible with polyesters and bonding process to create a monolithic sheet of material when complete.

C. Sheet minimum performance attributes:
   1. Rate of Burning (ASTM D 635). Material must attain CC1 Rating for a nominal thickness of 1.5 mm (0.060 in.) and greater.
   2. Self-Ignition Temperature (ASTM D 1929). Material must have a Self-ignition temperature greater than 650°F.
   3. Density of Smoke (ASTM D 2843). Material must have a smoke density less than 75%.
   4. Flame spread and Smoke developed testing (ASTM E 84). Material must be able to meet a level of Class A (Flame spread less than 25 and smoke less than 450) at thickness of 1".
   5. Room Corner Burn Test (NFPA 286). Material must meet Class A criteria at ¼" thickness as described by the International Building Code.
   6. Extent of Burning (UL 94). Must submit UL card.
   7. Impact strength. Minimum impact strength test as measured by ASTM D 3763 of 20 ft. lbs. (for durability, shipping, installation, and use).
   8. Safety Glazing. Material must attain a Class A impact rating in accordance with ANSI Z97.1-2004 at 1/8" thickness.
   9. UPITT Test for Combustion Product Toxicity: Product must be recorded as "not more toxic than wood".
   10. Dynamic environmental testing (ASTM standards D 5116 and D 6670). Panels must not have detectable VOC off-gassing agents and must be have Greenguard™ Indoor Air Quality certified.
   11. Panels must be produced from a minimum of 40% post-industrial recycle content. This recycle content must be certified by a recognized 3rd party certification group, such as Scientific Certification Systems (SCS).

2.03 FABRICATION

A. General: Fabricate Plastic Fabrications to designs, sizes and thicknesses indicated and to comply with indicated standards. Sizes, profiles and other characteristics are indicated on the drawings.

B. Comply with manufacturer's written recommendations for fabrication.

C. Machining: Acceptable means of machining are listed below. Ensure that material is not chipped or warped by machining operations.
   1. Sawing: Select equipment and blades suitable for type of cut required.
   2. Drilling: Drills specifically designed for use with plastic products.
   3. Milling: Climb cut where possible.
   4. Routing
   5. Tapping

D. Forming: Form products to shapes indicated using the appropriate method listed below. Comply with manufacturer's written instructions.
   1. Cold Bending
   2. Hot Bending
   3. Thermoforming: Acceptable only on uncoated material.
   4. Drape Forming
   5. Matched Mold Forming
   6. Mechanical Forming

E. Laminating: Laminate to substrates indicated using adhesives and techniques recommended by manufacturer.

2.04 MISCELLANEOUS MATERIALS

A. General: Provide products of material, size, and shape required for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaner: Type recommended by manufacturer.

C. Fasteners: Use screws designed specifically for plastics. Self-threading screws are acceptable for permanent installations. Provide threaded metal inserts for applications requiring frequent disassembly such as light fixtures.

D. Bonding Cements: May be achieved with solvents or adhesives, suitable for use with product and application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions where installation of Plastic Fabrications will occur, with Installer present, for compliance with manufacturer's requirements. Verify that substrates and conditions are satisfactory for installation and comply with requirements specified.

3.02 INSTALLATION

A. General: Comply with manufacturer's written instructions for the installation of Plastic Fabrications.

B. Manufacturer's shop to fabricate items to the greatest degree possible.

C. Utilize fasteners, adhesives and bonding agents recommended by manufacturer for type of installation indicated. Material that is chipped, warped, hazed or discolored as a result of installation or fabrication methods will be rejected.

D. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.

E. Form field joints using manufacturer's recommended procedures. Locate seams in panels so that they are not directly in line with seams in substrates.

3.03 CLEANING AND PROTECTION

A. Protect surfaces from damage until date of substantial completion. Repair work or replace damaged work, which cannot be repaired to Architect's satisfaction.

END OF SECTION

SECTION 06 8316
FIBERGLASS REINFORCED PANELING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fiberglass reinforced plastic panels.

B. Trim.

1.02 REFERENCE STANDARDS

A. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2010 (Reapproved 2018).

B. ASTM D5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels; 2017.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023.

D. FM 4880 - Approval Standard for Class 1 Fire Rating of Building Panrels or Interior Finish Materials; 2015.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Samples: Submit two samples 8 by 10 inch in size illustrating material and surface design of panels.

D. Submit Material Safety Data Sheets for the following items:
   1. All mastics, glues and adhesives
   2. Sealant (interior use only)

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store panels flat, indoors, on a clean, dry surface. Remove packaging and allow panels to acclimate to room temperature for 48 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fiberglass Reinforced Plastic Panels:
   1. Marlite, Inc: www.marlite.com/#sle.
   2. Nudo Products, Inc: www.nudo.com/#sle.
   3. Panolam Industries International, Inc: www.panolam.com/#sle.
   4. VALTO Engineered Materials (formerly Crane Composites): www.valtoem.com.
   5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PANEL SYSTEMS

A. Wall Panels at drywall partitions behind service sinks:
   1. Panel Size: 4 by 8 feet.
   2. Panel Thickness: 0.075 inch.
   3. Surface Design: Smooth.
   4. Color: White.
   5. Attachment Method: Adhesive only, with trim and sealant in joints.

2.03 MATERIALS

A. Panels: Fiberglass reinforced plastic (FRP), complying with ASTM D5319.

1. Surface Burning Characteristics: Maximum flame spread index of 25 and smoke developed index of 450; when system tested in accordance with ASTM E84.
2. Class 1 fire rated when tested in accordance with FM 4880.
3. Impact Strength: Greater than 6 ft lb force per inch, when tested in accordance with ASTM D256.

B. Trim: Vinyl; color coordinating with panel.

C. Adhesive: Type recommended by panel manufacturer.

D. Sealant: Type recommended by panel manufacturer; white.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions and substrate flatness before starting work.

B. Verify that substrate conditions are ready to receive the work of this section.

3.02 INSTALLATION - WALLS

A. Install panels in accordance with manufacturer's instructions.

B. Cut and drill panels with carbide tipped saw blades, drill bits, or snips.

C. Apply adhesive to the back side of the panel using trowel as recommended by adhesive manufacturer.

D. Apply panels to wall with seams plumb and pattern aligned with adjoining panels.

E. Install panels with manufacturer's recommended gap for panel field and corner joints.

F. Place trim on panel before fastening edges, as required.

G. Fill channels in trim with sealant before attaching to panel.

H. Install trim with adhesive and screws or nails, as required.

I. Seal gaps at floor, ceiling, and between panels with applicable sealant to prevent moisture intrusion.

J. Remove excess sealant after paneling is installed and prior to curing.

END OF SECTION

SECTION 07 1300
SHEET WATERPROOFING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Installation of blindside and pre-applied sheet waterproofing systems at locations as indicated on drawings.

1.02 RELATED SECTIONS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Section 033000 – Cast-In-Place Concrete

1.03 REFERENCES

A. Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method

1.04 SUBMITTALS

A. General: Submit in accordance with Section 01 3000.

B. Product Data: Submit manufacturer's product literature and installation instructions for each material specified.
   1. Include material descriptions and tested physical and performance properties of waterproofing.
   2. Include project-specific construction details and shop drawings showing transitions to adjacent construction materials, including, but not limited to: pre-applied membrane to post-applied membrane and post-applied membrane to underslab vapor retarder.
   3. Include manufacturer’s written instructions for evaluating, preparing and treating substrate.

C. Subcontractor’s approval by Manufacturer: Submit document stating manufacturer's acceptance of subcontractor as an Approved Applicator for the specified materials.

D. Submit list of proposed project personnel, including Subcontractor’s Project Manager, Supervisor, and Foreman, with a list of completed waterproofing projects for each. Indicate date of each project with a general description of the type of waterproofing installed and the facility size and use.

E. Warranty: Submit a sample warranty identifying the terms and conditions stated in Section 1.7.

1.05 QUALITY ASSURANCE

A. Applicator Qualifications:
   1. Applicator shall be experienced in applying the same or similar materials and shall be specifically approved in writing by the membrane system manufacturer for a minimum of five (5) years prior to the bid date.
   2. Applicator shall provide a full time supervisor at all times that the work of this Section is in progress. Supervisor shall have a minimum of three (3) years of successful project experience supervising projects of similar materials and scope, and shall be an employee of the Applicator.

B. Pre-Application Conference:
   1. Prior to beginning work, Contractor shall convene a conference to review project conditions with Architect, Waterproofing Consultant, concrete subcontractor, and any other affected trades.
   2. Agenda will include discussion of:

a. Review waterproofing requirements including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, quality assurance documentation, protection and repairs, schedules, and coordination with other work.

C. NOTE: If additional site visits are required by Architect's Consultant as a result of noncompliant waterproofing system installation, these shall be provided at Contractor's expense.

1.06 WARRANTY

A. Installer's Warranty: Two (2) Years, from date of completion and acceptance of the work required by this section, agreeing to promptly replace or otherwise repair defective waterproofing materials.

B. Manufacturer's Warranty: Upon completion and acceptance of the work required by this section, the manufacturer will issue a ten (10) year materials warranty, agreeing to promptly replace or otherwise repair defective materials.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in original, factory-sealed, unopened containers bearing manufacturer's name and label intact and legible with following information.
   1. Name of material.
   2. Manufacturer's stock number and date of manufacture.
   3. Material safety data sheet.

B. Store materials in protected and well-ventilated area, within the manufacturer's acceptable range of temperatures.

1.08 PROJECT CONDITIONS

A. Do not apply membrane if temperature is less than 40 degrees F (unless approved by membrane manufacturer), if precipitation is imminent, or the surface is wet or has frost.

B. Coordinate waterproofing work with other trades to ensure adequate illumination, ventilation, and dust-free environment during application and curing of membrane. The applicator shall have sole right of access to the specified areas for the time needed to complete the application and allow the membrane to cure adequately.

C. Coordination between various trades is essential to avoid unnecessary damage to the membrane.

D. Protect adjoining surfaces not to be coated against damage or soiling. Protect plants, vegetation and animals which might be affected by waterproofing operations.

E. Applicator shall provide applicable protective clothing and respiratory protection gear.

F. Maintain work area in a neat and orderly condition, removing empty containers, rags, and rubbish daily from the site.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

A. Source Limitations for Waterproofing System: Obtain waterproofing materials and protection/drainage panels from single source from single source manufacturer.

2.02 BLINDSIDE (PRE-APPLIED) WATERPROOFING SYSTEMS

A. CCW-MiraPLY-H by Carlisle Coatings and Waterproofing

B. Pre-Prufe 300R Plus by GCP Applied Technologies

C. TREMproof Amphibia by Tremco Commercial Sealants and Waterproofing

D. Approved pre-bid equivalent. Substitutions after bid date will not be considered.

2.03 POST-APPLIED SHEET MEMEBRANE WATERPROOFING SYSTEMS

A. CCW-MiraDRI 860/861 by Carlisle Coatings and Waterproofing

B. Bituthene 4000 by GCP Applied Technologies

C. TREMproof 560 by Tremco Commercial Sealants and Waterproofing

D. Approved pre-bid equivalent. Substitutions after bid date will not be considered.

2.04 ACCESSORY PRODUCTS

A. Provide the following accessories, supplied by and recommended by waterproofing membrane manufacturer.
   1. Seam Tape and detailing tapes
   2. Primers: suitable for substrate encountered and membrane specified, as recommended by waterproofing membrane manufacturer.
   3. Surface Conditioner: liquid, waterborne surface conditioner as recommended by waterproofing membrane manufacturer.
   4. Termination, Detail, Lap, and Membrane Sealants by waterproofing membrane manufacturer.
   5. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, of trowel grade or low viscosity.
   6. Reinforcing Fabric.
   7. Termination Bar: 1” stainless steel termination bar, holes pre-punched at six inches maximum on center.
   8. Waterstop: Self-adhering butyl rubber/bentonite joint compound, CCW Mirastop, GCP Adcor ES, Tremco Superstop, or equivalent, provided by waterproofing system manufacturer.
   9. Protection/Drainage Composite Course: waterproofing manufacturer’s geo-textile-faced, molded sheet drainage panel and protection board for vertical surfaces, as recommended by the manufacturer.
   10. Cleaner: Manufacturer’s standard membrane cleaner.
   11. Reinforcing Membrane/Flashing provided by manufacturer.

PART 3 - EXECUTION

3.01 WATERSTOP INSTALLATION

A. Prior to installing any concrete components creating a discontinuity at surfaces to receive waterproofing, provide installation of waterstop at horizontal member, in accordance with manufacturer requirements.

3.02 INSPECTION – GENERAL

A. Before any waterproofing work is started the waterproofing applicator shall thoroughly examine all surfaces for any deficiencies. Should any deficiencies exist, the architect, owner, or general contractor shall be notified in writing and corrections made prior to membrane installation.

B. All work shall be performed in accordance with manufacturer application instructions.

3.03 INSPECTION FOR BLINDSIDE WATERPROOFING

A. Verify that the compacted subgrade is dry, smooth, sound, and ready to receive waterproofing sheet.
   1. The substrate must be relatively even without noticeable high spots or depressions, relatively smooth, free of protrusions, debris, sharp edges or foreign materials and must be free of accumulated water, ice and snow.
   2. Gaps or voids greater than 2 inches in lagging or excavated substrate shall be filled with non-shrink grout prior to proceeding with waterproofing installation.

3.04 INSPECTION FOR POST-APPLIED SHEET MEMBRANE WATERPROOFING

A. Verify that concrete has cured and aged for minimum time period recommended in writing by waterproofing manufacturer.

B. Verify that substrate is visibly dry and within the moisture limits recommended in writing by manufacturer. Test for capillary moisture by plastic sheet method according to ASTM D 4263.

3.05 BLINDSIDE WATERPROOFING INSTALLATION

A. Install membrane in full accordance with manufacturer installation requirements and recommendations, except where more stringent requirements are provided in the Drawings and/or Specifications.

B. Apply the blindside membrane with bonding surface of the membrane facing inward toward area where the concrete will be poured. Fasten top edge of membrane to formwork as needed. Location and spacing of fasteners shall be per manufacturer requirements.

C. Carefully position successive sheets to overlap the previous sheet by 3 in. minimum along the lap line, or the minimum lap required by the manufacturer if greater than 3 inches. Ensure the product lays flat with no openings.
   1. End laps must be staggered and installed shingle fashion toward the exterior side of the membrane.
   2. Surface of lap area shall be cleaned per manufacturer’s instructions prior to adhesion of materials.

D. Remove release liner (if present) on the lap edge of the sheet and mate the two sheets together. Lap area shall be rolled with firm hand pressure.

E. After full installation completely remove the plastic liner (if present) prior to concrete placement. Within 24 hours of concrete pour, reinspect waterproofing membrane surface for debris and damage.
   1. Remove dust and other materials observed, by using pressurized air or water as required to provide a clean membrane system, in full accordance with manufacturer’s requirements.
   2. Repair all damage observed immediately and in full accordance with manufacturer’s requirements.
   3. Do not pour concrete in areas where membrane is damaged or where laps are not fully sealed. Do not pour concrete in areas that have not been inspected by Engineer.

3.06 SURFACE PREPARATION FOR POST-APPLIED SHEET MEMBRANE WATERPROOFING

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing 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 fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.

E. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks.
   1. Install sheet strips of width according to manufacturer's written instructions and center over treated construction and contraction joints and cracks exceeding a width of 1/16 inch (1.6 mm).

F. Bridge and cover isolation joints, expansion joints, and discontinuous deck-to-wall and deck-to-deck joints with overlapping sheet strips of widths according to manufacturer's written instructions.

1. Invert and loosely lay first sheet strip over center of joint. Firmly adhere second sheet strip to first and overlap to substrate.

G. Corners: Prepare, prime, and treat inside and outside corners:
   1. Install membrane strips centered over vertical inside corners. Install 3/4-inch (19-mm) fillets of liquid membrane on horizontal inside corners and as follows:
      a. At footing-to-wall intersections, extend liquid membrane in each direction from corner or install membrane strip centered over corner.

H. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions.

3.07 POST-APPLIED SHEET MEMBRANE WATERPROOFING INSTALLATION

A. Install membrane in full accordance with manufacturer installation requirements and recommendations, except where more stringent requirements are provided in the Drawings and/or Specifications.

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- (64-mm-) 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 (minus 4 and plus 5 deg C), install self-adhering, modified bituminous sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F (16 deg C).

D. Apply continuous sheets over already-installed sheet strips, bridging substrate cracks, construction, and contraction joints.

E. Seal edges of sheet-waterproofing terminations with mastic.

F. Install sheet-waterproofing and auxiliary materials to tie into adjacent waterproofing and vapor barrier per manufacturers' recommendations and approved Shop Drawings.

G. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending 6 inches (150 mm) beyond repaired areas in all directions.

H. Install protection/drainage composite after waterproofing installation has been observed by Waterproofing Consultant.

3.08 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. Use adhesives or other methods that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.

3.09 PROTECTION, REPAIR, AND CLEANING

A. Protect waterproofing from damage and wear during remainder of construction period.

B. Protect installed materials from damage due to UV light, harmful weather exposures, physical abuse, and other causes.

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 1900
WATER REPELLENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water repellents applied to exterior and interior cast stone surfaces.

1.02 RELATED REQUIREMENTS

A. Section 04 7200 – Cast Stone Masonry.

B. Section 07 9200 – Joint Sealants.

1.03 REFERENCE STANDARDS

A. ASTM D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings; 2005 (Reapproved 2013).

B. ASTM D5095 - Standard Test Method for Determination of the Nonvolatile Content in Silanes, Siloxanes, and Silane-Siloxane Blends Used in Masonry Water Repellent Treatments; 1991 (Reapproved 2013).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a meeting at least one week prior to starting work; require attendance of affected installers; invite Architect and Owner.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product description, limitations, and chemical composition.

C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention; cautionary procedures required during application.

D. Manufacturer's Field Reports: Report whether manufacturer's "best practices" are being followed; if not, state corrective recommendations. Email report to Architect the same day as inspection occurs; mail report on manufacturer's letterhead to Architect within 2 days after inspection.

E. Manufacturer's Qualification Statement.

F. Installer's Qualification Statement.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years experience.

1.07 MOCK-UP

A. Locate where directed.

B. Accepted mock-up may remain as part of the Work.

1.08 FIELD CONDITIONS

A. Protect liquid materials from freezing.

B. Do not apply water repellent when ambient temperature is lower than 50 degrees F or higher than 100 degrees F.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a one year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Silane, Siloxane, Silane-Siloxane Blend, and Siliconate Water Repellents:
   1. Diedrich Technologies: www.diedrichtechnologies.com
   2. PROSOCO, Inc: www.prosoco.com.
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Water Repellent: Non-glossy, colorless, penetrating, water-vapor-permeable, non-yellowing sealer, that dries invisibly leaving appearance of substrate unchanged.
   1. Applications: Vertical surfaces and non-traffic horizontal surfaces.
   2. Number of Coats: 1 or 2 coats as recommended by the manufacturer.
   3. VOC Content: Less than 100 g/L, when tested in accordance with ASTM D3960 or ASTM D5095.
   4. Water-based siloxane, silane, or blend that reacts chemically with concrete and masonry.
      a. Basis of Design: Sure Klean Weather Seal Siloxane PD.
      b. Apply with low-pressure spray, brush or roller.
      c. Typical Technical Data:
         1) Form: cloudy white liquid, odorless
         2) Specific Gravity: 0.996
         3) pH: 4 to 5
         4) Weight/Gallon: 8.29 pounds
         5) Active Content: 7 percent
         6) Total Solids: 4 percent ASTM D5095
         7) Flash Point: greater than 212 degrees F (greater than 100 degrees C) ASTM D 3278
         8) Freeze Point: 32 degrees F (0 degrees C)
         9) VOC Content: less than 30 grams per Liter, Low Solids Coating.
      d. Locations: Apply at exterior and interior cast stone.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify joint sealants are installed and cured.

C. Verify surfaces to be coated are dry, clean, and free of efflorescence, oil, or other matter detrimental to application of water repellent.

3.02 PREPARATION

A. Protection of Adjacent Work:
   1. Protect adjacent landscaping, property, and vehicles from drips and overspray.
   2. Protect adjacent surfaces not intended to receive water repellent.

B. Prepare surfaces to be coated as recommended by water repellent manufacturer for best results.

C. Do not start work until masonry mortar substrate is cured a minimum of 60 days.

D. Remove loose particles and foreign matter.

E. Remove oil and foreign substances with a chemical solvent that will not affect water repellent.

F. Scrub and rinse surfaces with water and let dry.

G. Allow surfaces to dry completely to degree recommended by water repellent manufacturer before starting coating work.

3.03 APPLICATION

A. Apply water repellent in accordance with manufacturer's instructions, using procedures and application methods recommended as producing the best results.

B. Apply at rate recommended by manufacturer, continuously over entire surface.

C. Remove water repellent from unintended surfaces immediately by a method instructed by water repellent manufacturer.

D. Provide manufacturer's field service representative to inspect preparation and application work to ensure that manufacturer's "best practices" for preparation and application are being followed.

END OF SECTION

SECTION 07 2100
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Board insulation at masonry cavity wall construction and exterior wall behind masonry veneer, MCM and metal panel wall finish.

B. Batt insulation in exterior wall construction.

C. Semi-Rigid Board/Blanket insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

D. Acoustical batt insulation for interior walls and above ceilings.

E. Mineral wool insulation for fire safing.

1.02 RELATED REQUIREMENTS

A. Section 07 2200 - Roof and Deck Insulation: Insulation specified as part of roofing system.

B. Section 07 8400 - Firestopping: Insulation as part of fire-rated through-penetration assemblies.

C. Section 09 2982 – Gypsum Board.

D. Section 09 5100 – Acoustical Ceilings.

1.03 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

B. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2024.

C. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).

D. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2017.

E. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2023.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023.

G. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C; 2019a.

H. BIA - The Brick Industry Association; Tech Note on Brick Construction, 28B Revised II.

I. ICC (IECC) - International Energy Conservation Code 2015.

J. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components; 2019.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements. Provide documentation that proposed insulation has been successfully tested per NFPA 285 with each specific exterior wall assembly for the project. Provide documentation of required detailing for proposed insulation board at openings in the exterior walls to comply with NFPA 285 requirements.

D. Test Report: Where NFPA 285 compliance is required by code, Submit test report verifying compliance with NFPA 285 for previously-tested exterior wall assembly.

E. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

F. Closeout Submittals:
   1. Submit under provisions of Section 01 7800 – Closeout Submittals
   2. Submit Material Safety Data Sheets under provisions of Section 01 7800 – Closeout Procedures for the following items:
      a. All mastics, glues, and adhesives.
      b. Thermal insulation (excluding fiberglass, foam, rubber).

1.05 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 FOAM BOARD INSULATION MATERIALS

A. Polyisocyanurate (ISO) Board Insulation with Facers Both Sides, installed on masonry wall, behind MCM or metal wall panels where indicated: Rigid cellular foam, complying with ASTM C1289; Type I, aluminum foil both faces; Class 1 or 2.
   1. Classifications:
      a. Type I: Faced with aluminum foil on both major surfaces of core foam.
         1) Class 1 or Class 2 - Glass fiber reinforced or non-reinforced core foam.
   2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   4. Complies with fire resistance requirements indicated on drawings as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.
   5. Compressive Strength: 25 psi at vertical locations.
   6. Board Size: 48 by 96 inch, cut to fit locations indicated. Thickness as noted on the drawings.
   7. Thermal Resistance: R-value of 6.0 per inch, minimum.
   8. Board Edges: As tested to be in compliance with NFPA 285.
   9. Manufacturers:
      a. Atlas Roofing Corporation: www.atlasroofing.com/sle.
      b. Carlisle Coatings & Waterproofing, Inc: www.carlisleccw.com/sle.
      c. Dow Chemical Company: www.dow.com/sle.
      d. Firestone Building Products: www.firestonebpco.com.
      e. Hunter Panels, LLC: www.hunterxci.com.
      f. Johns Manville: www.jm.com/sle.
      g. Ox Engineered Products: www.oxengineeredproducts.com/#sle.
      h. Rmax Inc: www.rmax.com.
      i. Siplast: www.siplast.com/#sle.
      j. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FIBERBOARD INSULATION MATERIALS

A. Glass Fiber Semi-Rigid Board/Blanket Insulation: Low density board, in accordance with ASTM C553, Type III.
   1. Provide in shim spaces, crevices in exterior wall/roof and expansion joints as detailed on the drawings.
   2. Facing: None, unfaced.
   3. Flame Spread Index: 25 or less, when tested with facing, if any, in accordance with ASTM E84.

4. Smoke Developed Index: 50 or less, when tested with facing, if any, in accordance with ASTM E84.
5. Board Size: 24 by 48 inch.
6. Board Thickness: 1 inch.
7. Board Edges: Square.
8. Maximum Density: 1.6 pounds per cubic foot, nominal.
9. Manufacturers:
    a. CertainTeed Corporation: www.certainteed.com.
    b. Johns Manville: www.jm.com.
    c. Knauf Insulation: www.knaufnorthamerica.com
    d. Owens Corning Corporation: www.ocbuildingspec.com.
    e. Substitutions: See Section 01 6000 - Product Requirements.

B. Mineral Fiberboard Insulation (Rock Mineral Wool): Moisture Resistant High Density Rigid Mineral Fiber, installed on masonry walls, over exterior sheathing, behind MCM or metal wall panels where indicated, ASTM C612, Type IV B; unfaced flame spread index of 0 (zero) when tested in accordance with ASTM E84.
1. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E84.
2. Board Size: 48 by 96 inches.
3. Board Thickness as noted on the drawings.
4. Thermal Resistance: R-value of 4.0 per inch at 75 degrees F, minimum, when tested according to ASTM C518.
5. Maximum Density: 8.0 pounds per cubic foot, nominal.
6. Products:
    a. Johns Manville: www.jm.com/#sle.
    b. ROCKWOOL (ROXUL, Inc): www.rockwool.com/#sle.
    c. Thermafiber, Inc: www.thermafiber.com/#sle.
    d. Substitutions: See Section 01 6000 - Product Requirements.

2.03 BATT INSULATION MATERIALS

A. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
2. Smoke Developed Index: 50 or less, when tested in accordance with ASTM E84.
3. Combustibility: Non-combustible, when tested in accordance with ASTM E136.
4. Formaldehyde Content: Zero.
5. Thermal Resistance: R-value of 11.0 at 3.5" and 19.0 at 6".
6. Facing: Unfaced.
7. Manufacturers:
    a. CertainTeed Corporation: www.certainteed.com.
    b. Johns Manville: www.jm.com.
    c. Knauf Insulation: www.knaufnorthamerica.com
    d. Owens Corning Corporation: www.ocbuildingspec.com/sle.
    e. Substitutions: See Section 01 6000 - Product Requirements.

B. Acoustical Batt Insulation:
1. Provide sound attenuation batts within interior walls and above ceilings, where indicated.
2. Glass fiber composition, unfaced.
    a. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
    b. Smoke Developed Index: 50 or less, when tested in accordance with ASTM E84.
    c. Thickness: 3.5 or 6 inch, nominal for given location.
    d. Facing: Unfaced.
3. Manufacturers:

a. CertainTeed Corporation: www.certainteed.com.
b. Johns Manville: www.jm.com.
c. Knauf Insulation: www.knaufnorthamerica.com.
d. Owens Corning Corporation: www.ocbuildingspec.com.
e. Substitutions: See Section 01 6000 - Product Requirements.

2.04 FIRE SAFING INSULATION

A. Mineral Fiber Batt Insulation (Mineral Wool): Flexible or semi-rigid preformed batt or blanket, complying with ASTM C665; friction fit; unfaced flame spread index of 0 (zero) when tested in accordance with ASTM E84.
1. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E84.
2. Where indicated or required, provide as fire safing of through penetrations, joint systems and perimeter containment in rated assemblies.
3. Size and Density: As required to prevent passage of fire between floors or through walls for rating stated.
4. Manufacturers:
a. Johns Manville: www.jm.com/#sle.
b. ROCKWOOL (ROXUL, Inc): www.rockwool.com/#sle.
c. Thermafiber, Inc: www.thermafiber.com/#sle.
d. Substitutions: See Section 01 6000 - Product Requirements.

2.05 ACCESSORIES

A. Air Barrier Sheet or Air Barrier Coating: See Section 07 2500.

B. Nails or Staples: Steel wire; electroplated or galvanized; type and size to suit application, prohibited for use with foam or high density rigid mineral fiber insulation boards.

C. Insulation Pins: Insulation manufacturer’s standard stainless steel pins with perforated plates, intended for installation in adhesive.

D. Adhesive: Type recommended by insulation manufacturer for application.
1. Adhesives used to attach exterior insulation to air barrier shall be approved by air barrier manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BOARD INSTALLATION AT EXTERIOR WALLS

A. Install Iboard insulation on masonry walls, behind MCM or Metal Wall Panels in accordance with fire resistance requirements shown on the drawings and as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.
1. Protect edges at door and window openings or other penetrations as tested in accordance with NFPA 285.
2. Blind fastening of insulation through the air/weather barrier is prohibited. Securement of installation boards shall be provided with adhesives or furring installed at the air/weather barrier surface prior to installation of boards.

B. Install boards vertically on walls.
1. Place boards to maximize adhesive contact.
2. Butt edges and ends tightly to adjacent boards and protrusions. Stagger board joints.

C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.03 BOARD INSTALLATION AT CAVITY WALLS

A. Install boards to fit snugly between wall ties.

B. Install boards vertically on walls.
   1. Place boards to maximize adhesive contact.
   2. Butt edges and ends tightly to adjacent boards and protrusions. Stagger board joints.

C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.04 BATT INSTALLATION

A. Install insulation in accordance with manufacturer's instructions.

B. Install in exterior wall spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

E. Wall Sound Insulation: Install Insulation in all metal stud walls unless noted otherwise. Where wall continue to deck, provide sound insulation full height of wall. Do not install insulation between studs where plumbing lines occur.

F. Ceilling Sound Insulation: Install above the entirety of all offices, restrooms, and workrooms and any other areas defined on the drawings.

G. Coordinate work of this section with construction of air barrier seal specified in Section 07 2500.

3.05 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 07 2119
FOAMED-IN-PLACE INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Foamed-in-place insulation.
   1. On underside of structure.
   2. In exterior wall crevices.
   3. At junctions of dissimilar wall and roof materials.
   4. In attics and crawlspaces.

1.02 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

B. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2025.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023.

D. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022a, with Editorial Revision (2023).

E. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials; 2013.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week prior to commencing work of this section.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide product description, insulation properties, overcoat properties, and preparation requirements.

C. Certificates: Certify that products of this section meet or exceed specified requirements.

D. Manufacturer's Installation Instructions: Indicate special procedures, and perimeter conditions requiring special attention.

1.05 QUALITY ASSURANCE

A. Provide insulation produced by a single and approved manufacturer.

B. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than five years of documented experience.

C. Applicator Qualifications: Company specializing in performing work of the type specified, with minimum five years of documented experience.

1.06 MOCK-UPS

A. Locate where directed.

B. Accepted mock-up may remain as part of the Work.

1.07 FIELD CONDITIONS

A. Do not apply foam when temperature is below that specified by the manufacturer for ambient air and substrate.

B. Do not apply foam when temperature is within 5 degrees F of dew point.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Foamed-In-Place Insulation:

1. Carlisle Spray Foam Insulation: www.carlislesfi.com/#sle.
2. Henry Company: www.henry.com/#sle.
3. Huntsman Building Solutions: www.huntsmanbuildingsolutions.com/#sle.
4. Johns Manville: www.jm.com/#sle.
5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Foamed-In-Place Insulation: Provide Medium-density, rigid or semi-rigid, closed cell polyurethane foam; foamed on-site, using blowing agent of water or non-ozone-depleting gas.
   1. Regulatory Requirements: Comply with applicable code for flame and smoke, concealment, and fire protection requirements.
   2. Thermal Resistance: R-value of 7.4, minimum, per 1 inch thickness at 75 degrees F mean temperature when tested in accordance with ASTM C518.
   3. Water Vapor Permeance: Vapor retarder; 2 perms, maximum, when tested at intended thickness in accordance with ASTM E96/E96M, desiccant method.
   4. Water Absorption: Less than 2 percent by volume, maximum, when tested in accordance with ASTM D2842.
   5. Air Permeance: 0.04 cfm per square foot, maximum, when tested at intended thickness in accordance with ASTM E2178 at 1.57 psf.
   6. Closed Cell Content: At least 90 percent.
   7. Surface Burning Characteristics: Flame spread/smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.
   8. Basis of Design:
      a. Huntsman Building Solutions; Heatlok HFO Pro: www.huntsmanbuildingsolutions.com/#sle.

2.03 ACCESSORIES

A. Primer: As required by insulation manufacturer.

B. Protective Coating: Intumescent coating of type recommended by insulation manufacturer and as required to comply with applicable codes.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify work within construction spaces or crevices is complete before insulation application.

B. Verify that surfaces are clean, dry, and free of matter that may inhibit insulation adhesion.

3.02 PREPARATION

A. Mask and protect adjacent surfaces from over spray or dusting.

B. Apply primer in accordance with manufacturer's instructions.

3.03 APPLICATION

A. Apply insulation in accordance with manufacturer's instructions.

B. Apply insulation by spray method, to a uniform monolithic density without voids.

C. Patch damaged areas.

D. Where applied to voids and gaps assure space for expansion to avoid pressure on adjacent materials that may bind operable parts.

E. Trim excess away for applied trim or remove as required for continuous sealant bead.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Inspection will include verification of insulation thickness and density.

3.05 PROTECTION

A. Do not permit subsequent construction work to disturb applied insulation.

END OF SECTION

SECTION 07 2129
SPRAYED INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cellulose insulation applied to underside of structure.

1.02 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 C739 - Standard Specification for Cellulosic Fiber Loose-Fill Thermal Insulation; 2017.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on materials, describing insulation properties and sealer.

C. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years of documented experience.

C. Products Specified by Flammability or Combustibility Criteria: Listed and classified by Underwriters Laboratories Inc.

1.05 MOCK-UP

A. Provide 1 mock-up, 8 feet long by 8 feet wide, illustrating wall construction, ceiling construction, window and frame, and door frame.

B. Locate where directed.

C. Approved mock-up may remain as part of the Work.

1.06 FIELD CONDITIONS

A. Do not install insulation, sealer when ambient and surface temperatures are lower than 40 degrees F.

B. Maintain acceptable ambient and substrate surface temperatures prior to, during, and after installation of primer and insulation materials and overcoat.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Cellulosic Fiber Sprayed Insulation:
   1. International Cellulose Corp: www.spray-on.com.
   2. ThermoCon, Inc: www.thermocon.com.
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Cellulose Fiber Insulation: ASTM C739; treated cellulose fiber, color shall be from manufacturer’s standard color chart conforming to the following test requirements:

1. Thermal Resistance (R-value): 3.75, at 1 inch thick when tested in accordance with ASTM C177 at 75 degrees F temperature
2. Density: 2 lb/cu ft, when tested in accordance with ASTM D1622/D1622M.
3. Moisture Absorption: Maximum 15 percent by weight.
4. Flame Spread and Smoke Developed Index: 10/0, when tested in accordance with ASTM E84.
5. Combustibility: Passing ASTM E136.
6. Basis of Design: K-13 Spray-On-Systems.

2.03 ACCESSORIES

A. Primer: As required by insulation manufacturer.

B. Insulation Stop: Plastic, profiled and sized to suit joist spacing and wall/sloped roof configuration.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are clean, dry, and free of matter that may inhibit adhesion.

B. Verify that ceiling hangers and supporting clips have been are installed correctly.

C. Verify other work on and within spaces to be insulated is complete prior to application.

3.02 PREPARATION

A. Mask and protect adjacent surfaces from overspray or damage.

B. Apply primer in accordance with manufacturer's instructions.

C. Install insulation stops between joist at wall/sloped roof construction to prevent insulation from covering soffit vents or from limiting air circulation from soffit to attic space.

3.03 INSTALLATION

A. Install insulation in accordance with manufacturer's instructions.

B. Install sprayed insulation to a uniform monolithic density without voids.

C. Install to achieve a thermal resistance R-value of 10.0 minimum.

D. Tamp wet sprayed insulation surface to improve adhesion and to achieve a smooth surface.

3.04 FIELD QUALITY CONTROL

A. Independent agency field inspection, If required, will be provided under provisions of Section 01 4000.

B. Inspection will include verification of insulation and sealer thickness and density.

3.05 PROTECTION

A. Do not permit subsequent construction work to disturb applied sprayed insulation.

END OF SECTION

SECTION 07 2200
ROOF AND DECK INSULATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Roof and Deck Insulation.

1.02 RELATED WORK

A. Section 06 1000 - Rough Carpentry

B. Section 07 5216 - SBS Modified Bituminous Roofing

C. Section 07 6200 - Sheet Metal Flashing and Trim

1.03 SYSTEM DESCRIPTION

A. Install rigid board insulation and coverboard as required to achieve a complete and proper substrate for the roof membrane system and associated crickets, saddles, and taper to provide complete drainage of stormwater. Refer to Part 2 and Drawings for insulation thicknesses required.

1.04 SUBMITTALS

A. Submit manufacturer's installation instructions, samples and product data, in accordance with the provisions of Division 1.

B. Submit fastening and adhesive patterns for field, perimeter, and corner areas to sufficiently comply with wind loads calculated in accordance with ASCE 7, as referenced by applicable Codes.

C. Submit roof plan indicating proposed dimensions of perimeter and corner zones, complying with minimum requirements specified in the Drawings.

D. Submit tapered insulation layout plans.

E. Submit manufacturer's certificate, in accordance with the provisions of Section 013300, that products meet or exceed specified requirements.

F. Submit certification from roof membrane manufacturer that board insulation materials are acceptable for use with roof membrane materials.

1.05 REGULATORY REQUIREMENTS

A. Conform to applicable local building codes for roof assembly requirements.

1.06 QUALITY ASSURANCE

A. Comply with PIMA and NRCA standards and requirements.

B. Materials shall comply with the requirements to meet UL Class A Ratings (UL 790 and UL 1256 Standard) and FM Global Class 1 (FM 4450 and FM 4470) requirements.

C. Contractor shall provide in-place mock-ups to illustrate insulation offsets and staggers in accordance with the requirements in this Section.

D. Work shall not commence prior to the Pre-Roofing Conference.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver and store products in accordance with the provisions of Division 1.

B. Any material becoming wet or damaged, including water stained facers will be rejected and shall be removed from the jobsite immediately and replaced at Contractor’s expense. Any insulation found to be improperly stored at the jobsite shall be considered wet at the discretion of the Architect and removed from the jobsite.

C. Materials Stored on Roof Levels for Immediate Use Only:

1. Comply with maximum roof live loads specified by the Structural Engineer.
2. Distribute to prevent concentrated loads that would impose excessive strain on deck or structural members.
3. Positively secure to prevent displacement by wind.
4. Tarp for protection from exposure as noted above.
5. Material storage on roof levels overnight is not allowed.

1.08 SEQUENCING AND SCHEDULING

A. Coordinate work under provisions of Division 1.

B. Coordinate the work of installing roof membrane and flashing as the work of this Section proceeds.

C. Plan roof layout with respect to roof deck slope to prevent rainwater drainage into completed roofing. All roof drains and/or scuppers shall be installed prior to beginning with installation. Contractor shall coordinate location and heights of drains/scuppers to ensure ponding does not occur after roof installation. Improper coordination for drainage components resulting in ponding or shaved rigid insulation will require correction at the Contractor's expense.

D. Do not install more insulation than can be covered with the complete roof system in the same day.

E. Do not install roofing until all wood blocking, roof curbs, and penetrations have been installed.

F. Do not install materials in fog and/or inclement weather or when rain is predicted (30% or more possibility) or when ambient temperature is below 40 F. The Contractor shall suspend work if in their opinion, wind speed will impede the proper installation of the roofing work or cause a danger to personnel or the property.

PART 2 - PRODUCTS

2.01 INSULATION MATERIALS

A. Flat Stock Polyisocyanurate Insulation, ASTM C1289, Type II, Class 2, Grade 2 (20 psi) closed cell foam core bonded to coated fiberglass facers, 4’x4’ maximum board dimension,
   1. Maximum board thickness: 2.6”.
   2. System Thickness (metal and membrane roofs over conditioned space): Two (2) layers 2.5” or 2.6” thickness insulation, total thickness 5” minimum.

B. Tapered Polyisocyanurate Insulation, ASTM C1289, Type II, Class 2, Grade 2 (20 psi) closed cell foam core bonded to coated fiberglass facers, slope as indicated in the Drawings,
   1. Maximum board thickness: 2.6”, except in locations where at least 3 layers of insulation are present.
   2. System thickness (membrane roofs over conditioned space): Total average thickness 5” minimum, with average calculated based on a maximum variation of 1 inch.

C. Tapered Edge Strips expanded perlite, ASTM C 728, Type 1.

D. Cover Board: 4’x8’ board dimension, 5/8” thickness, approved for use in Factory Mutual Very Severe Hail (VSH) approved assemblies.
   1. Dexcell FA VSH Glass Mat Roof Board
   2. Densdeck StormX Prime
   3. Pre-proposal approved equivalent.

2.02 ACCESSORIES

A. General: Provide fasteners approved by insulation manufacturer, meeting wind uplift requirements as specified.

B. Metal Decks: No. 12 hex-head fastener with coating which exceeds F.M. Specification No. 4470
   1. Induction welding type metal plates, approved by roof membrane manufacturer.

C. Insulation Adhesive: manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:
   1. Modified asphaltic, asbestos-free, cold-applied adhesive.
   2. Bead-applied, low-rise, one-component or multicomponent urethane adhesive.
   3. Full-spread spray-applied, low-rise, two-component urethane adhesive. .

PART 3 - EXECUTION

3.01 PREPARATION

A. Clean deck and ensure deck is dry prior to the application of new roof assembly.

B. Wet, water stained, warped, discolored, or physically damaged insulation and/or insulation facers will be rejected and must be removed from the project site.

C. Verify that:
   1. Roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set and comply with specified minimum flashing height requirements.
   2. Wood nailing strips at perimeter edges and parapet walls are in place and are fastened in accordance with applicable codes.
   3. Deck conditions are free and clear of dirt, rust, moisture, debris, and surface conditions are in accordance with manufacturer required guidelines for adhesion.
   4. Under deck conditions are clear for fastener installation. Contractor is responsible for field verifying the roof deck underside to ensure no equipment or MEP lines will be damaged from new fasteners. All damaged components will be the responsibility of the Contractor.
   5. Insulation strips are installed according to acoustical roof deck manufacturer’s written instructions.

D. Installation of materials means acceptance of conditions of substrate.

3.02 INSULATION INSTALLATION

A. Only install materials that can be temporarily sealed at the end of the workday. All open roof areas are to be temporarily sealed at the end of each workday or when inclement weather is expected. Any installed roof materials that become wet must be removed and replaced prior to continuing roofing

B. Verify and document in Daily Report that the existing deck/substrate is functional; insulation board is free from moisture and suitable as substrate for roof membrane.

C. Attachment Schedule: Comply with approved fastening patterns and zone widths.
   1. Metal Decks with Membrane Roofing:
      a. Mechanically fasten first layer of insulation to achieve uplift pressures indicated in Drawings in field, perimeter, and corners, and per approved fastening patterns based on pull out testing performed in accordance with Section 07 01 50. Ensure proper fastener engagement in substrate to provide full pullout resistance.
      b. Install subsequent layers of insulation and coverboard in adhesive in accordance with approved ribbon spacing patterns for field, perimeter, and corner areas and as specified below.
   2. Metal Decks with Metal Roofing:
      a. Mechanically fasten all layers of insulation to substrate, with boards laid in staggered pattern.
      b. Provide a minimum 8 fasteners per 4’x8’ board, with additional fasteners as required to ensure a smooth substrate for installation of underlayment materials and panel clips.

D. Mechanical Fastener Installation, General:
   1. Mechanically fasten first layer boards with approved fasteners and plates.
   2. Ensure that fasteners penetrate top flange of deck ¾-inch, do not penetrate bottom flange of deck. Reinstall fasteners that do not engage top flute of deck.

3. Provide fasteners in location per the approved fastening pattern and layout provided by the manufacturer. Provide required edge distance between fasteners and edge of boards.

E. Adhesive Application, General:
   1. Install insulation and coverboard layers in low-rise foam adhesive in accordance with approved ribbon spacing patterns and shop drawings for field, perimeter, and corner areas. Install adhesive in “picture frame” pattern in addition to ribbons required to achieve Code required resistance to wind uplift in field, perimeter, and corner zones. “Picture frame” pattern shall consist of a single bead of adhesive applied within 2” of board perimeter.
   2. Do not allow the adhesive application to precede the board placement by more than three board lengths.
   3. Allow low-rise foam adhesive to rise between ¾” to 1” prior to placement of boards, or as required by the manufacturer.
   4. Firmly press each insulation board into adhesive by “walking-in” each board immediately after placement. Provide a minimum of five (5) weighted five (5) gallon buckets per board at corners and center of each board. Boards not properly adhered will require to be removed and replaced.
   5. Stagger end joints in adjacent boards. Stagger successive layers in both vertical and horizontal directions. Minimum horizontal stagger is 2-feet; minimum vertical stagger is 12-inches.
   6. Butt edges for snug contact. Repair voids greater than ¼” wide by filling with like material.
   7. Tapered Insulation Sumps and Crickets:
      a. Curbs: Install upslope crickets at all curbs wider than 12 inches.
      b. Drains: Install a minimum 4’-0” by 4’-0” tapered insulation sump at all primary roof drains. Install a minimum 4’-0” by 2’-0” tapered insulation sump at all primary scuppers.
      c. Gutters: Install a minimum 1’-0” wide tapered edge to increase slope at membrane roof gutter edges.

F. Failure to install the roof insulation fasteners and/or low-rise foam adhesive as described in these specifications and the approved manufacturer’s assembly letter will be considered defective workmanship and application of the roof system by the Contractor. Contractor shall remove and replace all roof system materials with non-compliant attachment at no cost to the Owner.

END OF SECTION

SECTION 07 2700
AIR AND WATER BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air and Water Barriers.

B. Membrane Through Wall Flashings: Self-adhered membrane flashings that comprise part of the air barrier system, intended by the air barrier manufacturer for use in veneer wall construction.

1.02 RELATED REQUIREMENTS

A. Section 01 1400 - Quality Requirements: Coordinatin with Independent Testing and Inspections Agency.

B. Section 01 4339 - Mock-Up Wall Construction: Exterior wall mock-ups.

C. Section 04 2000 - Unit Masonry: Coordination of through wall flashing and masonry ties.

D. Division 07 Membrane Roofing Systems: Requirements for coordination with sequencing of membrane roofing; requirements to seal roof membrane to wall air and water barrier.

E. Section 07 6200 - Sheet Metal Flashing and Trim: Metal flashings installed in conjunction with air barriers.

F. Section 07 9200 - Joint Sealants.

G. Section 07 9500 - Expansion Joints.

H. Section 09 2116 - Gypsum Board Assemblies: Exterior Sheathing.

1.03 DEFINITIONS

A. Air and Water Barrier: One or more chemically compatible materials joined together in a continuous manner to restrict or prevent the passage of air and liquid water through the building thermal envelope and its assemblies while remaining vapor permeable to the permeance amounts as specified, with sealed seams and sealed joints to adjacent surfaces.

1.04 REFERENCE STANDARDS

A. AATCC Test Method 127 - Water Resistance: Hydrostatic Pressure Test; 2014.

B. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).

C. ASTM D903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds; 1998 (Reapproved 2010).

D. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2017.

E. ASTM D4541 - Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers; 2017.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023.

G. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022a, with Editorial Revision (2023).

H. ASTM E1186 - Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems; 2017.

I. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials; 2013.

J. ASTM E2357 - Standard Test Method for Determining Air Leakage of Air Barrier Assemblies; 2018.

K. ICC-ES AC38 - Acceptance Criteria for Water-Resistive Barriers; 2016.

L. ICC-ES AC212 - Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers over Exterior Sheathing; 2015.

M. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components; 2019.

N. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Preinstallation conference shall include the Architect, General Contractor, Manufacturer's Representative and Applicator. Agenda for meeting shall include but not be limited to the following:
   1. Review of submittals.
   2. Review of surface preparation, minimum curing period and installation procedures.
   3. Review of special details and flashings.
   4. Sequence of construction, responsibilities and schedule for subsequent operations.
   5. Review of mock-up requirements.
   6. Review of inspection, testing, protection and repair procedures.

B. Coordination of trades
   1. The Architect, General Contractor and Applicator shall evaluate adjacent materials such as windows, doors, etc. for conformance to project details. Adjacent trades shall provide scaled shop drawings for review by the Architect.
   2. The General Contractor shall make provision for installation of air seals between the primary air and water barrier and other wall components (penetrations, etc.) in order to maintain continuity of the air and water barrier system.
   3. The Applicator shall provide protection of rough openings before installing windows, doors, and other penetrations through the wall.

1.06 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on material characteristics, performance criteria, and limitations.

C. Shop Drawings: Provide drawings of special joint conditions.

D. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.

E. Air and Water Barrier membrane manufacturer shall provide an ICC-ES Evaluation Report confirming compliance with ICC-ES AC38 Acceptance Criteria for Water-Resistive Barriers and ICC-ES AC212 Acceptance Criteria for Water-Resistive Coatings used as Water-Resistive Barriers over:
   1. Glass-mat faced gypsum wall systems.
   2. Masonry wall systems.

F. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.

G. ABAA Installer Qualification: Submit documentation of current contractor accreditation and current installer certification; keep copies of each contractor accreditation and installer certification on site during and after installation, and present on-site documentation upon request.

H. Manufacturer's qualification statement.

I. Installer's qualification statement.

1.07 QUALITY ASSURANCE

A. Air Barrier Association of America (ABAA) Evaluated Air Barrier Assemblies; www.airbarrier.org/#sle: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture, and use secondary materials approved in writing by primary material manufacturer.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience, and approved by manufacturer. Air barrier Subcontractor(s) shall be accredited minimum of three years at the time of bidding and during the complete installation period by the Air Barrier Association of America (ABAA).

C. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air and water barrier material manufacture, and use secondary materials approved in writing by primary material manufacturer.

D. Components used in this section shall be sourced from one manufacturer, including membrane, air barrier sealants, primers, mastics, self-adhered flashings and adhesives as listed and approved as an evaluated air barrier assembly by the Air Barrier Association of America.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the job site in undamaged and original packaging indicating the name of the manufacturer and product.

B. All pail goods shall bear the ABAA Evaluated Air Barrier label

C. Store roll materials on end in original packaging.

D. Keep all products stored at above 40°F. Apply to a substrate with a surface T°F of 40°F and rising. DO NOT ALLOW PRODUCT TO FREEZE.

E. Protect rolls from direct sunlight until ready for use.

F. Do not double stack pail goods.

1.09 MOCK-UPS

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Mockups: Before beginning installation of air and water barrier, provide air and water barrier work for exterior wall assembly mockups, incorporating backup wall construction, external cladding, window, door frame and sill, insulation, roof tie-in and flashing to demonstrate surface preparation, crack and joint treatment, and sealing of gaps, terminations, and penetrations of air barrier membrane.
   1. Coordinate construction of mockup to permit inspection by Owner's testing agency of air and water barrier before external insulation and cladding is installed.
   2. If Architect determines mockups do not comply with project requirements, reconstruct mockups and apply air and water barrier until mockups are approved.
   3. Contractor shall provide an in-place mockup of each type of expansion joint transitions between air barrier and roofing systems, and at angle changes, prior to proceeding with this work. Failure to provide mockup for review and approval will result in required removal of cladding as required to allow observation by A/E.

C. Through Wall Flashing:
   1. Contractor shall provide an in-place mockup for review by Architect and Consultant of complete through wall flashing system, including metal drip edges, incorporating fully welded end dams at a typical termination of flashing.
   2. Failure to provide mockup or review of through wall flashing materials prior to installation of insulation and masonry may result in removal and reinstallation of materials at Contractor’s expense, as required to observe installed conditions at flashings.

3. Through wall flashings that are improperly installed or installed in the wrong position, regardless of whether cladding has been installed or not, shall be removed by the Contractor and new flashings installed to the proper condition at no cost to the Owner.

D. Install air and water barrier materials in mock-up specified in Section 04 2000.

E. Provide air/water leakage testing for air barrier materials and flashings located at mockup window systems per Division 8 Sections and 01 4000 - Quality Requirements.

1.10 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by materials manufacturers before, during, and after installation.

1.11 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide manufacturers 10 year material warranty.
1. Ensure all manufacturers installation guidelines, specifications, details and warranty requirements are met.
2. Warranty period shall be 10 years from date of substantial completion.

PART 2 PRODUCTS

2.01 AIR AND WATER BARRIER ASSEMBLIES

A. General: Air and water 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. At wall cladding transitions, the air and water barrier shall form a continuous air barrier and shall make provision for water drainage, either by creation of an unobstructed drainage plane that extends across the cladding transition or by flashing to discharge to the exterior at the transition. Air and water barrier assemblies shall be capable of accommodating substrate movement and sealing substrate expansion and control joints, construction material changes, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits, or interruption of the drainage plane.

B. Air and water barrier shall be compatible with the following wall systems:
1. Glass-mat faced gypsum wall systems.
2. Masonry wall systems.

C. The air and water barrier assembly, including but not limited to, fluid applied air and water barrier membrane, sheathing fabric, transition membrane and flashing primer shall be obtained or approved as a single-source from the membrane manufacturer to ensure system compatibility and integrity.

D. Use regular, high temperature or low temperature formulation depending on site conditions, within temperature ranges specified by the manufacturer and/or the Architect. Subject to compliance and compatibility with other requirements herein.

2.02 AIR AND WATER BARRIER MATERIALS (AIR AND WATER IMPERMEABLE AND WATER VAPOR PERMEABLE)

A. Air and Water Barrier, Fluid Applied, Vapor permeable, elastomeric barrier.
1. Air and Water Barrier Membrane:
a. Material: One-component, water-based, elastomeric emulsion membrane.
b. Dry Film Thickness (DFT): Shall be minimum thickness as specified in the manufacturer written instructions for the substrate being applied and to produce a smooth pinhole-free surface and as required to achieve warranty.
c. Air Permeance: 0.004 cfm/sq ft, maximum, when tested in accordance with ASTM E2178.
d. Water Vapor Permeance: 11 perms, minimum, when tested in accordance with ASTM E96/E96M using Procedure B - Water Method, at 73.4 degrees F.

e. Water Resistance: Water penetration resistance of 210cm or less, when tested in accordance with AATCC Test Method 127 test method for water resistance hydrostatic pressure.
f. Ultraviolet (UV) and Weathering Resistance: Approved by manufacturer for up to 180 days of weather exposure.
    1) Where exterior cladding with open joints are used, provide UV stable air and water barrier; approved by manufacturer for permanent expose to sunlight.
g. 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 or UL 723, with test specimen preperation in accordance with ASTM E2404.
h. Wall Assembly Burn Test: Where required by code, Air and Water Barrier, as a component of a wall assembly, shall have passed a NFPA 285 complete wall fire test.
i. Nail Sealability: Pass, when tested in accordance with ASTM D1970/D1970M.
j. Pull Adhesion: Passing at 16 min, when tested in accordance with ASTM D4541.
k. Crack Bridging: Pass, when tested in accordance with ICC-ES AC212 or ASTM C1305
l. Sealants, Tapes and Accessories: As recommended by air and water barrier manufacturer.
m. Products:
    1) Carlisle Coatings and Waterproofing, Inc; Barritech VP: www.carlisleccw.com.
    2) Henry Company; Air-Bloc 17MR, 33MR: www.henry.com/#sle.
    3) STS Coatings, Inc.; Wall Guardian: www.stscoatings.com.
    4) Tremco Commercial Sealants & Waterproofing; ExoAir 230: www.tremcosealants.com.
    5) Substitutions: See Section 01 6000 - Product Requirements.

2.03 ACCESSORIES

A. Sealants, Tapes, Primers, and Accessories for Sealing Air and Water Barrier and Adjacent Substrates: As indicated or in compliance with air and water barrier manufacturer's installation instructions.

B. Sealant for Cracks and Joints In Substrates: Resilient elastomeric joint sealant compatible with substrate and air and water barrier materials.
    1. Application: Apply at 30 to 40 mil, 0.030 to 0.040 inch, nominal thickness.

C. Self-Adhered High Temperature Membrane Through Wall Flashing:
    1. Provide 40 mil self-sealing, high temperature, flexible transition and membrane flashing with damage or puncture resistant film bonded to base adhesive that is:
        a. Butyl or modified asphaltic adhesive chemically compatible with air and water barrier and/or manufacturer's approved primer
        b. Designed to withstand elevated temperatures resisting degradation up to 240 degrees fahrenheit at roof flashing, roof to wall transitions and/or any building condition when installed directly behind dark colored cladding. Adhered flashing membrane per AAMA 711: pass all test criteria as type a (without primer), and modify Section 5.5.3 to level x 240 degrees f (115 degrees c) for 7 days.
        c. Designed to withstand elevated temperatures resisting degradation up 176 degrees fahrenheit at walls, through wall flashing and wall openings. If not otherwise applicable in b. above, adhered flashing membrane per AAMA 711: pass all test criteria as type a (without primer), and level 3, 176 degrees f (80 degrees c) for 7 days.
        d. Applied without flame required
        e. Lap peel strength per ASTM D903.
    2. Provide chemically compatible flexible membrane and transition flashing with air and water barrier material and manufacturer's warranty and associated accessories for:

a. Flashing at spandrels and cavities; under copings, band courses, and sills.
b. Windows, doors and other openings.
c. Over lintels and shelf angles.
d. At low roof to high wall conditions and all other wall conditions necessary to provide a watertight wall assembly.

3. Manufacturers: Flashings shall be provided by the air barrier manufacturer, or explicitly approved in writing by the air barrier manufacturer for use as part of their warranted air and water barrier system.
4. Accessories:
   a. Provide manufacturer’s surface conditioner and primer.
   b. Provide chemically compatible sealant along all edges of self-adhered flashing sealed in accordance with manufacturer's installation instructions.
   c. Provide stainless steel type 304 termination bar equal to Hohmann & Barnard model T2-FTS with pre-punched holes at 8-inches on center max.
   d. Refer to Section 07 6200 for metal through wall flashing drip edges and flashings, including but not limited to metal type, finish and/or gauge, unless otherwise noted in drawings.
5. Coordinate installation with the Exterior Cladding Contractor and other provisions as required in Divisions 04-Masonry, 07-Thermal and Moisture Protection and 08-Openings.

D. Thinners and Cleaners: As recommended by material manufacturer.

E. Backer Rod: ASTM C1330, Type C (closed cell material with a surface skin) and ASTM D5249 Type 3.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions are ready for work of this section.

B. Walls
1. Substrates
   a. Wall sheathing must be securely fastened per applicable building code and sheathing manufacturer’s requirements.
   b. Examine surfaces to receive air/water resistive barrier and verify that substrate and adjacent materials are dry, clean, sound, and free of releasing agents, paint, or other residue or coatings. Verify substrate is flat, free of fins or planar irregularities greater than 1/4" in 10'. Verify that no excess mortar exists on masonry ties, shelf angles and other obstructions.
   c. Verify that concrete is visibly dry and free of moisture.
   d. Verify that masonry joints are struck flush and completely filled with mortar.
2. Flashings
   a. All flashings must be installed in accordance with specific design and building code requirements. Where appropriate, end-dams must be provided.
   b. Openings must be flashed prior to window/door, HVAC, etc. installation. Windows and openings shall be flashed according to design and building code requirements.
   c. Individual windows that are ganged to make multiple units require continuous head flashing and the joints between the units must be fully sealed.
3. Kick-out flashing
   a. Kick-out flashing must be installed leak-proof and angled (min 100°) to allow for proper drainage and water diversion.
4. Air Seals
   a. Install between the primary air/weather barrier and other wall components (penetrations, etc.) in order to maintain continuity of the air barrier system

C. Where existing conditions are responsibility of another installer, notify Architect of unsatisfactory conditions.

D. Do not proceed with this work until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

B. Wall joints less than 1/2" shall be treated with liquid flashing as reccommended by the manufacturer.

C. Wall joints over 1/2" shall be treated with transition material or as reccommended by the manufacturer.

D. Through Wall Flashing:
   1. Install flashing to dry surfaces when air and surface temperatures are 40ºF and above.
   2. All flashings shall be installed to produce a fully watertight assembly.
   3. Prepare the masonry surfaces so that they are smooth and free of obstructions where installing flashings. Apply the surface conditioner per the manufacturers written recommendations for proper adhesion of the flashings.
   4. Precut pieces of flashing to easily handled lengths for each location.

E. Clean and prime substrate surfaces to receive adhesives and sealants in accordance with manufacturer's installation instructions.

3.03 INSTALLATION

A. Install materials in accordance with manufacturer's installation instructions.

B. Air and Weater Barriers: Install continuous airtight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.
   1. Apply additional membrane and/or sealant at all masonry wall ties and zee subframing fastened through air and water barrier for claddings.

C. Apply sealants and adhesives within recommended temperature range in accordance with manufacturer's installation instructions.

D. Prepare substrate in accordance with sheet manufacturer's installation instructions; fill and tape joints in substrate and between dissimilar materials.

E. Use flashing to seal to adjacent construction and to bridge joints in coating substrate.

F. Through Wall Flashings:
   1. General:
      a. Install membrane flashings shingled nd lapped to divert water to exterior at all locations where downward flow of water will be interrupted.
      b. Install metal through wall flashing in accordance with Section 07 6200. Metal flashing shall be continuous including at elevation changes (i.e. steps) and fully bed sealed at all splices, transitions and fully welded end dams.
   2. Installation:
      a. Remove release paper and position flashing carefully before placing it against the surface.
      b. When properly positioned, place against surface by pressing firmly into place by hand roller. Fully adhere flashing to substrate to prevent water from migrating under flashing.
      c. Overlap adjacent pieces 6” and roll all seams with a steel hand roller.
      d. Install prefabricated external and internal corners and fully welded end dams.

e. Extend the flashing from 1/2” inside the face of the exterior wall, through the exterior masonry wythe, and up the cavity space a minimum of 6" above the top of the cavity drainage system. Install termination bar at top of flashing and seal with mastic. Strip in air barrier over through wall flashing.
f. Apply a bead or trowel coat of mastic along flashing top edge, seams, cuts, and penetrations for a completely watertight condition.
g. Membrane flashing shall not be permanently exposed to sunlight.

3. Transitions:
   a. At all flashing terminations to openings, expansion joints, and changes in height, provide fully welded metal and membrane formed end dams with all seams sealed watertight.
   b. Provide compressible filler at the end of all flashings at steel lintels.
4. Protection:
   a. Do not expose flashing membrane to sunlight for more than thirty (30) days prior to enclosure.
   b. Do not allow the surface of the flashing membrane to come in contact with incompatible materials, including but not limited to polysulfide sealants, creosote, uncured coal tar products or EPDM.

G. Openings and Penetrations in Air and Water Barriers:
1. Installation of continuous air and water barrier to return into rough opening as indicated in drawings and extend into rough opening to seal to interior air sealant and backer rod for continuous air seal.
2. Install flashing extending a minimum 4 inches onto vertical wall and into rough opening with fully self adhered transition membrane.
3. Hollow Metal Door Frames: Seal door frame to wall surface with transition membrane.
4. Perimeter wood nailers at wall openings: Cover all exposed surfaces of wood nailers with transition membrane. Extend membrane over wall surface, sheathing, masonry and metal framing.
5. Aluminum frames: Seal frames to the air and water barrier and flashing assemblies.
6. Service and Other Penetrations: Form flashing around penetrating item and seal to air and water barrier.

H. Exterior Expansion Joints in Air and Water Barriers:
1. Expansion joints are required at all structural expansion joints and along slip tracks in metal stud framing systems at walls. Provide manufacturer’s recommended detailing at other locations with potential movement, including control joints in concrete masonry wall systems.
2. At new to existing expansion joints coordinate installation of new infill wall materials after removal of any existing cladding materials, to ensure that expansion joint at air and water barrier plane is in line with expansion joint at exterior cladding.
3. At new to existing expansion joints install air and water barrier materials at new infill wall, extending a minimum of 6 inches onto the existing backup wall and air and water barrier system. Ensure that all terminations of new air and water barrier at existing is air and water-tight.
4. Install insulation and fire rated materials at gap as indicated in the Drawings or required for wall construction.
5. Provide preformed silicone faced expansion joints, transition membrane flashing and backer rod at gap as indicated in the Drawings, fully stripped in with air and water barrier system in full accordance with manufacturer details and requirements.
6. Expansion joints at air and water barrier system shall be sealed air and watertight to expansion joint materials in roofing systems, with compatible materials.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Do not cover installed air barriers until required inspections have been completed.

C. Obtain approval of installation procedures from air barrier manufacturer based on a mock-up installed in place, prior to proceeding with remainder of installation.

D. Take digital photographs of each portion of installation prior to covering up air barriers.

E. Air and Water Barrier Protection and Failure Protocol:
   1. Contractor failure to provide the protection specified will result in the following, at no cost to the Owner:
      a. Replacement of all failed materials in full accordance with manufacturer requirements, to dry substrates. Failure is defined as inadequate adhesion, chemical deterioration, or blisters (entrapped air). After replacement the Contractor shall provide the above specified protection until completion of roofing materials.

3.05 PROTECTION

A. Do not leave materials exposed to sunlight, and/or weather longer than established by manufacturer.

B. Provide temporary protection measures as required to protect materials from damage after installation and prior to installation of remaining enclosure work.

END OF SECTION

SECTION 07 4213
METAL WALL PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Complete manufactured metal panel systems for walls and soffits, including related flashings, accessory components, and attachment of metal panel systems, including all required subgirt assemblies for walls and soffits to approved substrates.

1.02 RELATED REQUIREMENTS

A. Section 05 4000 - Cold-Formed Metal Framing: Wall panel substrate.

B. Section 06 1000 - Rough Carpentry

C. Section 07 2100 - Thermal Insulation.

D. Section 07 2700-Air and Water Barriers: Air and water barrier under wall panels.

1.03 REFERENCE STANDARDS

A. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum; 2025.

B. ASTM A480/A480M - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip; 2020.

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 A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2021a.

E. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

F. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

G. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate allowable system pressures, dimensions, layout, joints, construction details, methods of anchorage.

C. Samples: Submit two samples of wall panel and soffit panel, 12 inch by width of panel in size illustrating finish color, sheen, and texture.

D. Manufacturer's Qualification Statement.

E. Installer's Qualification Statement.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in installing products of the type specified in this section with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.

B. Store prefinished material off the ground and protected from weather; prevent twisting, bending, or abrasion; provide ventilation; slope metal sheets to ensure proper drainage.

C. Prevent contact with materials that may cause discoloration or staining of products.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Furnish a written warranty signed by the Panel Applicator for a two (2) year period from the date of substantial completion of the building guaranteeing materials and workmanship for the preformed metal panel system, flashings and penetrations.

C. Furnish manufacturer's standard 20-year written finish warranty stating that architectural fluorocarbon finish will be:
   1. Free from fading or color change in excess of 5 NBS units as measured per ASTM D2244;
   2. Will not chalk in excess of a numerical rating of 7 when measured in accordance with standard procedures specified in ASTM D4214;
   3. Will not peel, crack, chip or delaminate

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers:
   1. Berridge Manufacturing Company: www.berridge.com.
   2. Centria: www.centria.com.
   3. Fabral Wall and Roof Systems: www.fabral.com
   4. Longboard Products: www.longboardproducts.com.
   5. MBCI: www.mbci.com.
   6. McElroy Metal: www.mcelroymetal.com.
   7. Petersen Aluminum Corporation: www.pac-clad.com.
   8. Zeeff Panel Systems: www.zeeffpanels.com.

2.02 MANUFACTURED METAL PANELS

A. Panel System: Factory fabricated prefinished metal panel system, site assembled.
   1. Provide exterior panels, soffit panels, and subgirt framing assembly.
   2. Design Loads: In addition to the self-weight of the panel systems, metal panel systems shall be designed to resist the maximum of the following: Wind Pressures indicated on the Structural Drawings, or the wind pressures required by the version of ASCE 7 referenced in the version of the International Building Code (IBC) for this project.
   3. Anchorage: Provide anchorage into approved substrate for complete metal panel system capable of resisting all required loads and pressures (i.e. gravity and wind).
   4. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.
   5. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
   6. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.
   7. Corners: Factory-fabricated in one continuous piece with minimum 2 inch returns.
   8. Provide continuity of air barrier and vapor retarder seal at building enclosure elements in accordance with materials specified in Section 07 2700.
   9. Custom Fluoropolymer Coating System: Polyvinylidene fluoride (PVDF) multi-coat thermoplastic fluoropolymer coating system, including minimum 70 percent PVDF color topcoat and minimum total dry film thickness of 0.9 mil; color and gloss as scheduled in Schedule of Materials and Colors.

B. Exterior Wall Panels:
   1. Profile: Vertical and horizontal, as indicated; style as indicated.
   2. Material: Precoated aluminum sheet, 20 gage, 0.032 inch minimum thickness.
   3. Panel Width: 16 inches.
   4. Color: As scheduled in Schedule of Materials and Colors.

C. Screen Wall Panels:
   1. Profile: As indicated on the drawings; Corrugated panels, with 2.67” x 7/8” deep profile ribs.
   2. Material: Precoated aluminum sheet, 20 gage, 0.032 inch minimum thickness.
   3. Perforation: 1/8” round holes on .324” staggered centers, 13.5% open area
   4. Panel Width: 36 inches.
   5. Color: As scheduled in Schedule of Materials and Colors.

D. Soffit Panels:
   1. Profile: See Schedule of Materials on the drawings.
   2. Material: Precoated 6063-T5 aluminum sheet.
   3. Panel Width: 6 inches.
   4. Perforated Metal Soffit Panels: Where noted on the drawings as vented soffits panels, panel shall have perforations providing 12% net free vent area.
   5. Color: As scheduled in Schedule of Materials and Colors.

E. Metal Framing Members: Include sub-girts, zee-clips, base and sill angles and channels, hat-shaped and rigid channels, and furring channels required for complete installation. Where installed in horizontal orientation, provide vented or slotted sub-girts, furring’s and/or channels to provide adequate drainage.
   1. Provide material strength, dimensions, configuration as required to meet applied loads and in compliance with applicable building code.
   2. Sheet Steel Components: ASTM A653/A653M galvanized to G90/Z275 or zinc-iron alloy-coated to A60/ZF180; or ASTM A792/A792M aluminum-zinc coated to AZ60/AZM180.
   3. Stainless Steel Sheet Components: ASTM A480/A480M.
   4. Aluminum Components: ASTM B209/B209M; or ASTM B221 (ASTM B221M).

F. Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitered to required angles.

G. Expansion Joints: Same material, thickness and finish as exterior sheets; 22 gage, 0.0299 inch thick; manufacturer's standard brake formed type, of profile to suit system.

H. Trim, Closure Pieces, Caps, Flashings, Facias, and Infills: Same material, thickness and finish as exterior sheets; brake formed to required profiles.

I. Anchors: Galvanized steel.

2.03 MATERIALS

A. Precoated Steel Sheet: Aluminum-zinc alloy-coated steel sheet, ASTM A792/A792M, Commercial Steel (CS)) or Forming Steel (FS), with AZ50/AZM150 coating; continuous-coil-coated on exposed surfaces with specified finish coating and on panel back with specified panel back coating.

2.04 ACCESSORIES

A. Concealed Sealants: Non-curing butyl sealant or tape sealant.

B. Fasteners: Manufacturer's standard type to suit application; steel, hot dip galvanized.

C. Field Touch-up Paint: As recommended by panel manufacturer.

D. Bituminous Paint: Asphalt base.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that building framing members are ready to receive panels.

3.02 PREPARATION

A. Install subgirts perpendicular to panel length, securely fastened to substrates and shimmed and leveled to uniform plane. Space at intervals indicated.

3.03 INSTALLATION

A. Install panels on walls and soffits in accordance with manufacturer's instructions.

B. Protect surfaces in contact with cementitious materials and dissimilar metals with bituminous paint. Allow to dry prior to installation.

C. Fasten panels to structural supports; aligned, level, and plumb.

D. Locate joints over supports.

E. Provide expansion and control joints where indicated or as recommended by the manfacturer.

F. Use concealed fasteners unless otherwise approved by Architect.

G. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.

3.04 TOLERANCES

A. Maximum Offset From True Alignment Between Adjacent Members Butting or In Line: 1/16 inch.

B. Maximum Variation from Plane or Location Indicated on Drawings: 1/4 inch.

3.05 CLEANING

A. Remove site cuttings from finish surfaces.

B. Remove protective material from wall panel surfaces.

C. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

D. Upon completion of installation, thoroughly clean prefinished aluminum surfaces in accordance with AAMA 609 & 610.

END OF SECTION

SECTION 07 4213.16
ALUMINUM METAL PLATE WALL PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES:

A. Pressure-equalized aluminum exterior wall panel system.

B. Related Requirements:
1. Section 05 4000 – Cold-Formed Metal Framing: Wall panel substrates support framing.
2. Section 07 2700 – Air and Water Barriers: Air and moisture barrier required as part of metal wall panel
3. Section 07 6200 – Sheet Metal Flashing and Trim: Field-formed flashings and other sheet metal work.
4. Section 07 9200 – Joint Sealants: Perimeter sealant.
5. Section 09 2116 - Gypsum Board Assemblies: Wall Sheathing.

1.02 DEFINITION

A. Metal Plate Wall Panel Assembly: Metal wall panels, attachment system components, miscellaneous metal framing, and accessories necessary for a complete weather-tight wall system based on AAMA CW- RS-1.

1.03 REFERENCES

A. American Architectural Manufacturers Association (AAMA):
1. AAMA CW-RS-1 – The Rain Screen Principle and Pressure Equalized Wall Design.
2. AAMA 501.1 – Standard Test Method for Water Penetration of Windows, Curtain Walls and Doors Using Dynamic Pressure.
3. AAMA 501.2 – Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems.
4. AAMA 508 – Voluntary Test Method and Specification for Pressure Equalized Rain Screen Wall Cladding Systems.
5. AAMA 611 – Voluntary Standards for Anodized Architectural Aluminum.
6. AAMA 2605 – Voluntary Specification, Performance Requirements, and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusion and Panels.

B. Aluminum Association (AA):
1. ADM – Aluminum Design Manual.
2. DAF-45 – Designation Systems for Aluminum Finishes.

C. American Society of Civil Engineers (ASCE) ASCE/SEI7 – Minimum Design Loads for Buildings and Other Structures.
1. ASTM International (American Society for Testing and Materials):
2. ASTM B 209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
3. ASTM E 330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Differences.
4. ASTM E331 – Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Differences.
5. ASTM E1233/E1233M – Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights, and Curtain Walls by Cyclic Air Pressure Differential.
6. ASTM D4214 – Standard Test Method for Evaluating the Degree of Chalking of Exterior Paint Films.
7. ASTM E 283 – Standard Test Method for Determining Rate of Air Leakage Through Exterior Window, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
8. ASTM D2244 – Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates

9. ASTM D2247 - Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity

D. LEED – Leadership in Energy and Environmental Design

E. NAAMM – National Association of Architectural Metal Manufacturer

1.04 REQUIREMENTS

A. Coordination: Coordinate panel assemblies with rain drainage, flashing, trim, stud back-up, soffits, and other adjoining work.

B. Pre-installation Meeting:
1. Attendees: Owner, Architect, Installer, Panel Manufacturer's Representative, Structural Support Installer's, and all Installer's whose work interfaces with or affects wall panels including installers of doors, windows, and louvers.
2. Review and finalize construction schedule.
3. Verify availability of materials, installer's personnel, equipment, and facilities needed to maintain schedule.
4. Review means and methods related to installation, including manufacturer's written instructions.

1.05 SUBMITTALS

A. Action Submittals:
1. Shop Drawings: Include elevations, layout, profiles, and components including:
a. Details showing thickness and dimensions of system parts, edge conditions, attachments, corners, fastening and anchoring methods, locations of joints and gaskets, location and configurations of joints necessary to accommodate thermal movement, and trim and flashings.
2. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each material and accessory.

B. Samples: Submit for each type of exposed finish required.
1. Approval sample size is 2 inch by 3 inch.

C. Test and Inspection Reports: Submit test and inspection reports on each type of wall panel system provided for project based on evaluation of comprehensive test performed by qualified testing agency.

D. Maintenance Data: Submit maintenance data for metal plate wall panels.

E. Warranty: Submit manufacturer system warranty.

1.06 QUALITY ASSURANCE

A. Qualifications:
1. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with at least five years of documented experience.
2. Installer: Company specializing in performing work of this section and approved by the manufacturer.
a. Install system in strict compliance with manufacturer's installation instructions.
b. Minimum 5-year continuous experience installing aluminum wall panels.
3. Regulatory Requirements: Wall panel system evaluated and is in compliance with applicable building code.

B. Mockup: Provide mockup to verify selections made under contract document to demonstrate visually How the system works and to establish quality standards for fabrication and installation.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Storage and Handling: Store materials in clean, dry, interior area in accordance with manufacturer's instructions.

C. Deliver panels, components, and other manufactured items without damage or deformation.

D. Provide storage of panels to ensure dryness, with positive slope for drainage of moisture.

E. Do not store panels in contact with other materials that might cause staining, denting, or other surface damage.

F. Remove strippable protective covering from aluminum panel prior to installation.

1.08 WARRANTY

A. Wall System Warranty: Provide manufacturer's warranty, agreeing to correct defects in manufacturing of materials within a two-year period after date of Substantial Completion.
   1. Failures include, but are not limited to the following:
      a. Structural failures, including rupturing, cracking, or puncturing.
      b. Deterioration beyond normal weathering of wall system metals and other materials.

B. Panel Finish Warranty: Provide panel finish manufacturer warranty, agreeing to repair finish of metal wall panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Finish Warranty Period:
      a. Paint Finish: Provide manufacturer's 20-years warranty against cracking, peeling, fading, or chalking from the date the panels ship to the customer.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Basis of Design: Zeeff Panels Systems Origin Premiere Series – Aluminum Wall Panel System.

B. Other Approved Manufacturers
   1. Pohl Panel of America
   2. Centria Intercept
   3. Substitutions: See Section01 6000-Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Metal Plate Wall Panel Assemblies: Comply with performance requirements without failure due to defective manufacturing, fabrication, installation, or other construction defects.

B. Design, fabricate, and erect a dry joint, pressure equalized rainscreen aluminum wall panel system without use of sealants, gaskets, or butyl tape, tested as installed in compliance with AAMA 508, and as follows.
   1. Pressure Equalization Cycling: Pass cycled pressure loading from 5 psf to 25 psf for 100 three-second cycles at 0.08 seconds or less; ASTM E 1233.
   2. Air Infiltration: 0.12 cfm per sf of wall area, tested at 1.57 psf (25 mph) in accordance with ASTM E 283.
      a. Maintain air/water barrier leakage rate at 0.11 to 0.13 cfm per sf at 1.57 psf when tested in accordance with ASTM E 283 inch compliance with AAMA 508 criteria.
   3. Water Penetration:
      a. Static: Pass water penetration test under static pressure when tested in accordance with ASTM E331 at a differential of 10 percent of inward acting design load, with 15 psf pressure differences for at least 15 minutes with 5 gal per sf per hour of water applied.
   4. Structural: Provide systems tested in accordance with ASTM E 330 and certified to be without permanent deformation or failure of structural members.

2.03 MATERIALS

A. Aluminum Plate: Alloy and temper as recommended by manufacturer for application and in compliance with Manufacturer's design requirements.
   1. Aluminum Material: Tension-leveled, fluoropolymer 100% FEVE painted finish, 5052-H32 manganese alloy.
   2. Thickness: 0.125 inch.
   3. Weight: Less than 3 lbs. per sf.
   4. Finish: Smooth (Fine Texture)

B. Panel Depth: 1 1/2-inch, nominal.

C. Panel Joints: 5/8" horizontal joints and 5/8" vertical joints.

2.04 FABRICATION

A. System Type: Pressure equalized rainscreen; Interlocking joint design with allowance for ventilation while preventing excessive water to contact air/water barrier

B. Provide Post finished material to form panels, trims, and extrusions.

2.05 FINISHES

A. Meet performance criteria of AAMA 2605:
   1. Type: FEVE (Fluoroethylene Vinyl Ether) finish
   2. FEVE: AAMA 2605, fluoropolymer finish containing not less than 100 Thermosetting FEVE Resin percent

B. Superior Performance Organic Coating System: AAMA 2605 Single coat, thermally cured Fluoroethylene Vinyl Ether (FEVE) Powder system.

C. One-Coat Fluoropolymer: AAMA 2605, fluoropolymer finish containing not less than 100 percent FEVE Powder by weight in color coat. Prepare, pre-treat, and apply coating to exposed metal surface to comply with coating and Powder manufacturer's installation instructions.
   1. Color: See Schedule of Materials and Colors on the drawings.

2.06 ACCESSORIES

A. Metal Plate Wall Panel Accessories: Provide components required for a complete metal plate wall panel Assembly, including trim, copings, fascia, mullions, sills, corner units, flashings, and similar items. Match material and finish of panels unless otherwise indicated.

B. Flashing and Trim: Match material, finish, and color of adjacent wall panels.
   1. Thickness: At least 0.050 inch.

C. Panel Fasteners: Designed to withstand design loads, with at least 7/16-inch diameter head and neoprene washer.
   1. Aluminum Wall Panel Material: Stainless steel fasteners.

D. Sub-Girts: Provide size and gauge in accordance with project requirements.
   1. Furring Channel: Provide Hat, C, U or Z type as recommended by manufacturer.
   2. Flat Strap: At least 14 gage thick.

E. Substrate Wall Sheathing: Refer to Drawings and Section 09 2116 for requirements.

F. Weather Barriers: Provide specific weather barrier with performance characteristics for air penetration, water vapor transmission, and water penetration. Refer to Section 07 2700 for requirements.

G. Sealants: As recommended by metal panel manufacturer for openings within wall panels and perimeter conditions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, and work areas and conditions for compliance with requirements for installation tolerances, wall panel supports, and other conditions affecting performance of this Work.

B. Examine wall framing to verify that girts, angles, channels, studs, and other structural wall panel support members and anchorage have been installed within alignment tolerances required by wall panel manufacturer.

C. Verify that weather barrier has been installed over sheathing or substrate to prevent air infiltration or water penetration.

D. Proceed with installation only after unsatisfactory conditions have been corrected

3.02 PREPARATION

A. Miscellaneous Framing: Install required sub girt, base angles, sills, furring, and other wall panel support member and provide anchorage in accordance with ASTM C754 for gypsum panel type substrates and panel manufacturer’s installation instructions.

3.03 INSTALLATION

A. Install wall panel system in accordance with manufacturer’s installation instruction and approved shop drawings.

B. Install proper sub framing in accordance with manufacturer for system attachment.

C. Install system plumb, level, and true to line.

D. Install wall panels with tolerances for thermal and structural movement.

E. Install shims to plumb substrates as necessary for installation of wall panels.

F. Install weather tight seals at perimeter of wall panel openings.
   1. Test for proper adhesion on small unexposed area of solid surfacing prior to use.

G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA - Architectural Sheet Metal Manual.
   1. Provide concealed fasteners where possible, and set units true to line and level as indicated.
   2. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
   3. Install flashing and trim as wall panel Work proceeds.

H. Install weather tight escutcheons for pipe and conduit penetrating exterior walls.

I. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action as recommended by wall panel manufacturer.

J. Install attachment system to support wall panels and with provisions to provide a complete weather tight wall system, including sub girts, extrusions, flashings and trim.
   1. Include attachment to supports and trims at locations using dissimilar materials.
   2. Do not apply sealants to joints, unless noted otherwise on Drawings or Shop Drawings.
   3. Install required parts/pieces per manufacturer’s shop drawings at base course and at cut panel locations where required.

K. Install accessories with positive anchorage to building and weather tight mounting and provisions for thermal expansion, and coordinate installation with flashings and other components.
   1. Install components required for a complete wall panel assembly including trim, copings, flashings and other accessory items.

L. Weather Barrier: Install weather barrier behind wall panels and over substrate in accordance with requirements of Section 07 2700.

3.04 ADJUSTING

A. Repair minor damage so that repairs are not visible from viewing distance of 10 feet

3.05 CLEANING

A. Please refer to the manufacturer's cleaning and maintenance guide for proper cleaning procedures of the completed installed wall panel.

B. Ensure that weep holes and drainage channels are unobstructed from debris.

3.06 PROTECTION

A. Protect installed panels from damage during the duration of construction.

B. Repair or Replace panels if damaged beyond repair.

END OF SECTION

SECTION 07 5216
SBS MODIFIED BITUMINOUS ROOFING

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. SBS modified bitumen membrane roofing.

B. All roofing and flashing work shall be completed as shown on the drawings and here-in specified, and shall be installed in strict accordance with the Roofing Manufacturer's specifications and details. It is the Roofing Contractor's responsibility to ensure that all roofing details and installations comply with the manufacturer's specifications in order to secure the full roofing warranty as specified. Any modifications in roofing details shall be submitted with shop drawings for Architect's approval.

1.02 RELATED SECTIONS

A. Related Work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Section in Division 1 of these specifications.

B. Section 01 4500 – Quality Control.

C. Section 06 1000 – Rough Carpentry.

D. Section 07 2200 – Roof and Deck Insulation.

E. Section 07 6200 – Sheet Metal Flashing and Trim.

F. Section 07 7200 – Roof Accessories.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM) – Latest Edition:
   1. D 41 Asphalt Primer Used in Roofing and Waterproofing.
   2. D 4586 Asphalt Roof Cement, Asbestos Free, SBS compatible.
   3. D 5147 Standard Test Methods for Sampling and Testing Modified Bituminous Sheet Material
   4. D 6162, D 6163, D 6164 Standard Specifications for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials (various reinforcement types)

B. National Roofing Contractor's Association (NRCA): Roofing Manual, Membrane Roof Systems, 2019.

C. FM Global Loss Prevention Data Sheets 1-28 through 1-54, Latest Edition.

D. ASCE 7-(per governing building code). - American Society Of Civil Engineers "Minimum Design Loads for Buildings and Other Structures"

E. Underwriters Laboratory Building Materials Directory, Latest Edition.

1.04 QUALITY ASSURANCE

A. Manufacturer:
   1. Company specializing in manufacturing the products specified in this Section with a minimum of five years documented experience.
   2. Obtain primary products, including roof membrane, base flashings, membrane adhesives and adhesives products from a single manufacturer. Provide secondary products recommended by the manufacturer of primary products for use with roofing system provided.

3. The roofing systems manufacturer shall provide non-sales related field auditors for the purpose of performing quality assurance inspections, both in-progress and final inspections. Provide copies of the manufacturer's field auditor inspection report to the contractor, roof consultant, and building owner.

B. Contractor:
   1. Be currently approved and certified to install low slope roof systems that qualify for the primary roofing material manufacturer's 20-Year No Dollar Limit (NDL) Guarantee; and use only skilled roofers completely familiar with the products and the manufacturer's current recommended methods of installation.
   2. Contractor shall maintain a permanent office for conduct of business and shall operate its own full-service sheet metal shop and be an active NRCA authorized ES-1 fabricator.
   3. Submit a letter from the roofing material manufacturer proposed for the project, stating that your company is an approved and certified applicator, and that your company is approved to install that manufacturer's Twenty (20) Year No Dollar Limit (NDL) Guarantee.
   4. Successful completion of minimum three (3) similar projects during that time. Contractor to provide project reference contact names, phone numbers, and emails as part of submittal process.
   5. All torching operations must be performed by CERTA (Certified Roofing Torch Applicator) trained applicators with up to date certifications.
   6. Evidence of Contractor's qualification to do business in the State of Texas where the project is located or covenant to obtain such qualification prior to award of the contract.
   7. Workers:
      a. Project Manager, Superintendent, and Foreman: Minimum five years roofing experience and employed by Contractor for a minimum one year prior to Bid Date.
      b. Designate a responsible Project Manager or Superintendent to inspect all installed Work, particularly tie-ins and temporary flashings, at end of each working day and as otherwise required to ensure water-tightness.
         1) Verify Inspection by signature on approved Daily Inspection Form signifying installation is in accordance with specified requirements.

C. Regulatory Requirements:
   1. New Roof System shall be classified by Underwriters Laboratories Inc., UL 90, as a "Class A " rated roof covering.
   2. System shall meet the minimum Wind Uplift Requirements per ASCE 7-(per governing building code) for approved assembly and specified warranty coverage.
   3. Follow local, state, and federal requirements, safety standards, and codes.
   4. Refer to applicable building codes for roofing system installation requirements and limitations. When conflict exists, the more restrictive document will govern.

D. Pre-installation Conference:
   1. Two weeks prior to roofing installation, conduct pre-installation conference at project site.
   2. Attendance: Owner, Architectural Observer, Roof Consultant, General Contractor, General Contractor and Roofing Contractor project superintendents, roof applicator (foreman), and roof manufacturer's technical representative.
   3. Agenda:
      a. Scheduling of roofing operation.
      b. Daily production anticipated.
      c. Designation of key individuals and their respective responsibilities.
      d. Processing procedures of field and change orders.
      e. Review of staging and material storage locations.
      f. Accommodations for temporary services (water, power).
      g. Coordination of work by other trades.
      h. Protection of completed roofing.

i. Emergency rain protection procedures.
j. Discussion of process for manufacturer's inspection and acceptance of completed roofing and flashings.
k. Manufacturer's deck inspection to be performed.

E. Installation:
1. Installation shall be in accordance with procedures and standards set forth by National Roofing Contractors Association.
2. Installation shall be in accordance with manufacturer's current published application procedures and general recommendations of National Roofing Contractor's Association. Follow Underwriters Laboratories' requirements acceptable for use with specified products or systems.
3. Roofing shall be as described in this section and shall be provided and approved by roof system manufacturer. Materials not manufactured or provided by manufacturer shall have written approval from manufacturer stating that materials are acceptable and are compatible with other materials and systems required.

F. There shall be no deviations made from manufacturer's published specification, this specification, or approved shop drawings without prior written approval of Architect, Architectural Observer, Roof Consultant and Roof Membrane Manufacturer’s representative.

G. Perform work on this section in accordance with best standards of practice relating to trades involved.

H. Pullout Tests: Conduct pullout test on deck using appropriate fastener prior to roof system installation. Pull out test shall be performed in accordance with ANSI/SPRI FX-1 2016 Standard Field Test Procedure for Determining the Withdrawal Resistance of Roofing Fasteners. Submit pullout results for manufacturer's review to determine specific fastening pattern for this project. Submit copy of pullout results to Architect.

I. Material Manufacturer's Inspection Paid for By Contractor:
1. Inspections shall be made during Project schedule by authorized representative of roof system manufacturer to ensure that said Project is installed in accordance with manufacturer's requirements. Manufacturer shall provide written report to the Architect within five days of each inspection stating acceptance of Contractor procedures and outlining items of non-compliance with manufacturer's requirements.

J. Material Manufacturer's Final Inspection:
1. Manufacturer's authorized representative shall provide final inspection at completion of project to ensure that project has been completed in accordance with manufacturer's requirements. Upon approval and acceptance of the entire project, the manufacturer's warranty shall be written, executed, and furnished to Owner.
2. Contractor shall pay for manufacturer's final inspection and additional inspections.

K. Laboratory Testing and Samples:
1. At Owner's request, obtain 3 field samples of completed roof membrane and assembly. Take samples at locations designated by Owner's Representative, Architectural Observer, and test for compliance with requirements on Contract Documents and with manufacturer's published performance criteria. Test shall be performed by nationally recognized testing laboratory in accordance with accepted ASTM methods. Contractor shall assume costs for extraction and patch of samples. Owner will assume costs for testing of field sample.
2. If, for any reason, areas that are tested by Owner fail to meet manufacturer's requirements, then subsequent expense for retesting of those areas will be the responsibility of the Contractor.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original, unopened containers or packages with labels intact and legible. Any materials delivered to the site must be stored immediately by the Contractor in a compliant manner.

B. Store materials in accordance with the Polyisocyanurate Insulation Manufacturers Association (PIMA) Technical Bulletin #109 and manufacturer's recommendations in a secure manner to avoid damage, danger to occupants, or theft.
   1. Store rolled goods on clean, raised platforms. Store other materials in dry area, protected from water and direct sunlight.
   2. All materials must be covered with breatheable tarps and on pallets. Polyethylene covers or manufacturer’s wrap are not acceptable field storage coverings. Contractor shall cut wrapped board goods to allow venting of condensation during storage.
   3. Adhesives, flashing cements, and pail goods must be stored inside lockable trailers and in original containers with lids tightly in place.

C. Provide continuous protection of materials against deterioration for duration of project.

D. Any material becoming wet or damaged, including water stained facers will be rejected and shall be removed from the jobsite immediately and replaced at Contractor’s expense. Any insulation found to be improperly stored at the jobsite shall be considered wet at the discretion of the Architect and removed from the jobsite.

E. Materials Stored on Roof Levels for Immediate Use Only:
   1. Comply with maximum roof live loads specified by the Structural Engineer.
   2. Distribute to prevent concentrated loads that would impose excessive strain on deck or structural members.
   3. Positively secure to prevent displacement by wind.
   4. Tarp for protection from exposure as noted above.
   5. Material storage on roof levels overnight is not allowed.

1.06 PROJECT CONDITIONS

A. Environmental Requirements:
   1. Apply roofing in dry weather.
   2. Do not install roofing in fog and/or inclement weather or when rain is predicted (30 % or more possibility) or when ambient temperature is below 40 degrees Fahrenheit. The Contractor shall suspend Work, if in his/her opinion, wind speed will impede the proper installation of the roofing Work, or cause a danger to its personnel, or the Owner's property.
   3. Roof deck shall be dry and free from any moisture, ice or other deleterious materials prior to roofing. Observe wind chill, humidity and other hot/cold weather conditions for proper application.
   4. Do not expose stored roofing materials and accessories to constant temperature in excess of 180 degrees Fahrenheit. Provide a minimum of two (2) fire extinguishers immediately adjacent to locations of stored and in-use flammable goods.

B. Restore to original condition or replace work and materials damaged during handling.

C. Emergency Equipment: Maintain on site equipment necessary to apply emergency temporary seals in event of sudden storms or inclement weather.

1.07 SEQUENCING AND SCHEDULING

A. Roof system shall be sealed in a watertight manner every day. Moisture confirmed present within the new roof system including water stained facers by the Architect’s Roof Consultant will be cause for rejection and installation of new roofing at Contractor’s expense.

B. Coordinate roofing schedule with work of other trades. Contractor is responsible for ensuring that new roof penetrations are coordinated to be fully sealed and/or flashed the same day they are created.

C. Notify manufacturer's representative forty-eight hours in advance for deck acceptance.

D. Apply roof installation with respect to deck slope. Avoid situations where excessive drainage could pass into completed roofing.

E. Maintain communication with roofing manufacturer's representative to inform of progress and to schedule periodic sample testing.

F. On Parapet Wall Conditions, roofing may not proceed until all walls are complete.

G. All wood blocking, roof curbs, and penetrations shall be installed and secured prior to beginning with roof installation.

H. All roof drains and/or scuppers shall be installed prior to beginning with roof installation. Contractor shall coordinate location and heights of drains and scuppers. Improper coordination of drainage components will require to be corrected at Contractor’s expense.

1.08 WARRANTY

A. Manufacturer's Warranty:
   1. Manufacturer's twenty (20) year "non-prorated, no dollar limit" system warranty shall cover product quality, performance and workmanship, including roofing and membrane flashings. Warranty shall include insulation, coverboard, and roof membrane from roof surface up into parapet cap without exclusions. Warranty shall include full cost of repair and replacement of all damaged roof assembly components. The manufacturer’s warranty shall commence upon the project’s date of substantial completion.
   2. Wind Rider: Warranty shall provide coverage for wind gusts of up to 90 miles per hour. Warranty shall include inspections as required by the Manufacturer after wind events exceeding 55 mph or major storm events.
   3. Hail Rider: Warranty shall provide coverage for up to 2-inch diameter hail impacts.

B. Provide three (3) Roof Warranty Signs at the completion of the project. Signs shall be placed on roof at locations determined by the Owner.
   1. Warranty Signs: 24” x 24” x .080 aluminum with a baked enamel background and black lettering, secured to avoid penetration of roof or wall waterproofing membranes, to read as follows:

WARNING:
ROOF AREA: (Roof designation)
ROOF WARRANTY NUMBER: (Manufacturer’s Warranty Number)
THIS ROOF IS UNDER WARRANTY UNTIL
(Date)
(MANUFACTURER)
(Manufacturer’s Phone No.)
DO NOT MAKE ALTERATIONS OR REPAIRS
TO THIS ROOF WITHOUT APPROVAL FROM OWNER
CONTACT
OWNER CONTACT INFOMRATION
(Owner's Phone No.)
FOR APPROVAL AND/OR TO REPORT DAMAGE REQUIRING REPAIRS

C. Contractor's Warranty: In addition, Contractor shall furnish written warranty agreeing to replace failing roofing or flashing due to defective material or workmanship. Warranty shall include other work performed by Contractor but which may be described in other sections including, but not limited to, Sealants and Caulking, Sheet Metal, Insulation, and Roof Accessories. Warranty shall include membrane from roof surface up into parapet cap without exclusions. Warranty period is two (2) years from the date of the project's substantial completion.
   1. Contractor shall coordinate and perform a roof inspection with the roof material manufacturer's representative and the Owner's representative annually, and during the ninety (90) day period preceding the expiration date of the Contractor's warranty. All deficient items identified during these inspections, including blisters and moisture between plies, shall be repaired by Contractor at no expense to the Owner.

1.09 SUBMITTALS

A. Shop drawings, product data, and samples under provisions of Section 01 3300 – Submittals Procedures.

B. Submit the following items:
   1. Contractor's executed insurance certificate.
   2. Detailed project sequencing, staging, material loading, manpower plans, and detailed project construction schedule for approval.
   3. Sample of warranty that is to be issued upon project completion.
   4. Product Data: for all materials specified and proposed for use on the Project. Submit MSDS for all sealants, adhesives and sealant primers.
   5. Shop Drawings: shall be approved by the membrane manufacturer and Architect for approval prior to work start.
      a. Roof plan drawing indicating:
         1) Fastening pattern zone widths.
         2) Detail callouts for each roof area condition.
         3) Tapered insulation layout including sumps at primary roof drains and/or scuppers.
         4) Walkpad layout around all motorized equipment, landings for ladders, around roof hatches, in front of doors, and any other locations shown in the drawings or required by the manufacturer, whether shown on the drawings or not.
      b. Details:
         1) Provide details of all flashing conditions required for the project. If details are being generated based on Architect's drawings, Contractor shall clearly indicate all deviations being proposed.
         2) Provide manufacturer's standard details (subject to contract document requirements), including:
            (a) Base flashings, penetrations, and membrane terminations.
            (b) Fastening patterns for field, perimeter, and corners.
   6. Contractor shall submit written statement that their company or any subcontractor they may use is not employing workers classified as undocumented workers on this project.

C. Manufacturer Certificate: Provide project specific system letter, signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article. Include evidence of compliance, including:
   1. Compliance with performance requirements.
   2. All roofing system components are listed for the project, including and not limited to base sheets, adhesives, fasteners, mastics, insulation, coverboards, liquid flashings, and membranes.
   3. Components are physically and chemically compatible for installation as designed.
   4. All proposed materials, including those by other manufacturer's, are acceptable to membrane manufacturer for use in system and are not excluded from the warranty.

5. Proposed system meets all criteria for issuance of required manufacturer's warranty
6. Identify fastening patterns to be used in field, perimeter, and corner.
7. Specifically identify and define any deviations.
    a. Items not clearly identified to be deviations by the Contractor do not represent acceptance to modify or change the project requirements. All deviations must be clearly identified and accepted by the Architect.

D. Closeout Submittals:
1. Submit under provisions of Section 01 7800 – Closeout Submittals.
2. Manufacturer’s final report and fully executed warranty.
3. Submit updated Material Safety Data Sheets under provisions of Section 01 7800 – Closeout Submittals for the following items:
    a. All mastics, glues, and adhesives
    b. Thermal insulation (excluding fiberglass, foam, rubber)
    c. Sealant (interior use only)

PART 2 – PRODUCTS

2.01 PRIMARY MATERIALS

A. Roofing Membrane Assembly:
1. Two-ply roof membrane assembly complying with ASTM D6163 Type I or II or D6164, Type I or II, Grade S (base ply) and Grade G (cap sheet); consisting of a prefabricated, reinforced, homogeneous Styrene-Butadiene-Styrene (SBS) block copolymer modified asphalt base (and where required for specified warranty term, interply) membrane, applied over a prepared substrate followed by a white granulated reinforced fire rated finish ply.

B. White granulated finish ply must have a minimum roof reflectance and emittance to meet three-year aged solar reflectance of 0.55, three-year aged thermal emittance of 0.75, and/or three-year aged solar reflectance index of 64, or greater.

C. Flashing Membrane Assembly.
1. Two-ply modified bitumen, reflective granule surfaced sheet over a smooth base ply, with reinforcing impregnated and coated with high quality Styrene-Butadiene-Styrene (SBS) modified bitumen.

2.02 MEMBRANE

A. Acceptable Manufacturers and Products:
1. Siplast:
    a. Base Ply: Paradiene 20 TG, Paratech 180 Base TG.
    b. Top Ply: Paratech 180 Cap TG, Paradiene 30 FR TG C.
2. Soprema:
    a. Base Ply: Elastophene or Sopralene Flam 180.
    b. Top Ply: Elastophene or Sopralene Flam 180 FR GR.
3. US Ply:
    a. Base Ply: DuraFlex 190S TG.
    b. Top Ply: Duraflex G4FRTG, 190FRTG.
4. CertainTeed:
    a. Base Ply: Flintlastic Poly SMS, Flintlastic Base 20 T.
    b. Top Ply: Flintlastic GTS-FR Coolstar.
5. Johns-Manville:
    a. Cap Sheet: Dynaweld Cap 180 FR
    b. Base Ply: Dynaweld 180 S
6. Approved equivalent.

B. Products furnished for roofing system shall be products of single manufacturer.

2.03 INSULATION

A. Reference Section 07 2200 – Roof and Deck Insulation of these specifications for Roof and Deck Insulation.

2.04 FASTENERS

A. Fasteners shall be compatible with all materials with which they come in contact so that dielectric corrosion does not occur.
   1. Wood Substrate:
      a. Flashing Nails: flat head ring shank, galvanized steel; length as required to provide 1-inch penetration minimum into substrate.
      b. Screws: No. 10 stainless steel wood screws with stainless steel bonded neoprene washers of length necessary to penetrate wood substrate one inch.
   2. Metal Substrate:
      a. Minimum No. 10 stainless steel sheet metal screws or as necessary to suit application with stainless steel bonded neoprene washers where exposed.
   3. Concrete and Masonry Substrate:
      a. Round head stainless steel drive pin and neoprene washer with lead expansion anchor, FS FF-S-325, group IV, Type II.
         1) Acceptable Product: Rawl Plug, The Rawl Plug Company, Inc. or approved equivalent
      b. Flat head stainless steel concrete/masonry screw, 3/16” diameter, length sufficient to provide 1” min. embedment into substrate.
         1) Acceptable Product: Tapcon Concrete/Masonry Anchors or approved equivalent.

B. Termination Bar: Stainless steel bar with a mill finish, width one inch (1"), thickness 0.100" ± .008", flat, having predrilled holes eight inches (8") on center. Install where perimeter flashings exceed 24” or as required by the manufacturer.

2.05 RELATED MATERIALS

A. Asphalt Primer: ASTM D41; approved by roof system manufacturer.

B. Cold Adhesive: Asphalt cutback adhesive, with non-asbestos fibers and bond enhancing modifiers, as recommended by manufacturer.

C. Asphaltic Plastic Cement: Approved by roof system manufacturer, SBS compatible.
   1. Inclines Up to ½" Per Foot: ASTM D4586, Type I.
   2. Inclines Exceeding ½" Per Foot: ASTM D4586, Type II.

D. Cant Strip:
   1. Non-Structural: Perlite, solid.
   2. Structural: Fire retardant treated wood, note that stainless steel fasteners are required at all locations for securement of fire retardant treated wood.
   3. Cant Height Above Substrate: 3-5/8" minimum.

E. Edge Sealant: Rubberized Neoprene based sealant.

F. Wood Nailers and Blockings: Reference Section 06 1000 – Rough Carpentry
   1. Where lumber or plywood is indicated or specified as “treated”, comply with applicable requirements of the American Wood Preservers Association (AWPA) Standard C2 for Lumber and C9 for Plywood.
   2. Pressure treated wood components shall be with “water-borne” preservatives only, and to comply with the American Wood Preservers Bureau (AWPA) LP-2 Directive.

G. Walk Tread: Shall be pre-formed, skid-resistant surface, constructed with modified asphalt, 36” x 36” surfaced with ceramic granules (Color as approved by owner) for use around all mechanical and HVAC equipment and between roof access points and equipment regardless if shown on the Drawings.

H. Fiberglass Coated Membrane: A non-rotting, non-absorbent woven fiberglass membrane having a vinyl coating designed for membrane reinforcement for all roof repairs. Compatible with either tar or asphalt bituminous, having ten (10) open-weave squares per inch.

I. Single Ply Flashing Membrane: 60 mil minimum, PVC or KEE membrane fully adhered to plywood or coverboard wall substrates receiving roof flashings in excess of 24" in height. Membrane shall be approved by the primary roof system manufacturer and incorporated into the system warranty. Provide membrane coated metal receiver at base of flashing membrane and heat weld membrane to coated metal. Refer to Section 076200 for attachment and detailing of metal flashings.

J. Sealant: Shall be a one-component urethane non-sag, gun grade sealant designed for use in active exterior joints, and shall meet or exceed Federal Specification No. 1 TT-S-00230C, Type II, Class A, ASTM C920. Where joint surfaces are contained or are contaminated with bituminous materials, provide manufacturer's modified-type sealant (modified with coal-tar or asphalt as required), or approved equal.

K. Ceramic Granules: # 11 grade specification ceramic granules of color scheme matching the granule surfacing of the finished ply.

L. Liquid-Applied Reinforced Flashing System: Single-component, poly-methyl-methacrylate (PMMA) resin with polyester reinforcing fleece fabric fully embedded into the resin to form roof system flashings, provided by primary roof membrane manufacturer.

2.06 MISCELLANEOUS MATERIALS

A. Best grade or quality approved by roofing manufacturer for specific application.

2.07 ASBESTOS CONTAINING MATERIALS

A. No asbestos containing materials shall be used on jobsite or incorporated into work.

PART 3 - EXECUTION

3.01 GENERAL

A. Perform work of this Section in accordance with the manufacturer and the best standards of practice relating to trades involved, unless modified by these specifications. Consider roof system manufacturer's technical specifications part of this specification and use as reference for specific application procedures and recommendations.

B. Follow local, state and federal regulations, safety standards and codes. When conflict exists, the more restrictive document shall govern.

C. Follow insurance underwriter's requirements acceptable for use with specified products or systems.

D. Roofing application shall only be performed when ambient temperature is greater than 40 F and rising, and shall include wind and wind chill factors.

E. Complete roofing, flashing, sheet metal, and other related items daily.

F. Install cap sheet within 30 days of application of base ply, or sooner, if specifically recommended by the manufacturer.

3.02 EXAMINATION OF SURFACES

A. Examine roof deck and related surfaces, and verify that there are not conditions such as inadequate anchorage, foreign materials, moisture, ridges, or other conditions which would prevent satisfactory installation of roofing system.

B. Correct conditions requiring correction or completion prior to installation of roofing system. Notify Owner's Representative (Architectural Observer, Contractor Officer) of unacceptable conditions.

C. Do not proceed until defects are corrected.

D. Verify location of interior ducts, electrical lines, piping, conduit, and similar obstructions. Perform work in manner to avoid contact with above mentioned items.

E. Verify debris has been removed.

F. Start of work under this Part Three constitutes acceptance of deck substrate and site conditions by roofing contractor.

3.03 PREPARATION

A. Sleeves and Curbs: Clean, secure, and extend sleeves, curbs, ducts and other work which pass through roof as required to receive new roofing system. Ensure all curbs and penetrations provide a minimum flashing height of twelve inches above the planned roof system thickness at each location. Verify that 2'-0" minimum clearance is provided between all penetrations and from roof perimeters and planned roof system valleys leading to drainage points. Do not begin roofing until all penetration conditions have been verified to meet these requirements.

B. Prior to application of membrane, remove foreign matter from substrate. Debris between substrate and roof membrane is not acceptable.

C. Carefully broom clean substrate immediately prior to roofing application.

3.04 ROOF MEMBRANE INSTALLATION

A. Apply roof system in strict accordance with manufacturer's published recommendations. Do not use membrane roll hooks in a manner that damages roof ply during torching operations.

B. Base Ply Membrane Application: Over the specified insulation system, embed the base ply by torching, starting at the low point, laying sheets at a right angle to the slope of the deck, heat welding to the specified substrate, lapping sides and ends a minimum of 3 inches. Heat weld membrane in an "L" pattern, ensuring 1/8" minimum to ¼" maximum "bleed out" along laps to provide full adhesion without damaging membrane.
   1. Perform light rolling or brooming promptly to eliminate air pockets, wrinkles, creases, and fishmouths, and to insure proper adhesion.
   2. Extend base ply up cant strips, extending two inches (2") minimum above cant. Lap end joints at least 3 inches.
   3. Install base ply continuously in one direction from the field of the roof to the top of the cant.
   4. At end laps, cut the under ply side lap 45 degrees as recommended by the membrane Manufacturer.
   5. Prevent foot or vehicle traffic from crossing newly laid base ply sheets until bitumen cools to below softening point, or adhesive is cured.
   6. Install water cutoffs at the end of the day's operation. Remove prior to resuming additional work. Seal perimeters into watertight condition.

C. Application of modified bitumen cap sheet:
   a. Offset side laps and end laps from those of the base ply.
   b. Embed cap sheet by torching, starting at the low point, laying plies at a right angle, heat welding to the top face of the interply sheets, lapping sides minimum of 3 inches and end laps a minimum of 6 inches. Ensure sufficient "bleed out" along laps to provide full adhesion without damaging membrane.
   c. Stagger laps between plies. For torched applications, heat and embed granule surface at top surface end laps to aid adhesion.
   d. At end laps, cut the under ply side lap 45 degrees as recommended by the membrane Manufacturer.
   e. Perform light rolling or brooming promptly to eliminate air pockets, wrinkles, creases, and fishmouths, and to insure proper adhesion.
   f. Extend top ply up cant strips, extending two inches (2") minimum above cant. Lap end joints at least 3 inches.

g. Install top ply continuously in one direction from the field of the roof to the top of the cant.
h. Broadcast mineral granules over all bitumen or adhesive overruns to ensure a monolithic surface color.
i. Install water cutoffs at the end of the day's operation. Remove prior to resuming additional work. Seal perimeters into watertight condition.

3.05 MODIFIED BITUMEN BASE FLASHING

A. Place cant strips on top of roof insulation or nailer. Nail to deck and to wall or vertical nailer where possible. If not possible to nail, secure by applying plastic roof cement.

B. General:
1. Apply flashings only after cant and roofing membrane is in place. Prepare the surface area that is to receive flashing coverage by torch heating and embedding granular surfaces and by application of asphalt primer; allowing primer to dry thoroughly.
2. Install each ply by torching or setting in cold adhesive using 3'-0" widths (cut off the end of roll) always lapping the factory selvage edge. Stagger the laps of the top flashing layer from lap seams in the base layer. Extend the base ply flashing sheet a minimum of 6 inches beyond the toe of the cant onto the prepared surface of the finished roof and up the wall to a minimum 12 inch flashing height. Extend top ply of flashing an additional 6 inches beyond edge of base ply onto the prepared roof membrane surface and up the wall to a minimum 12 inch flashing height. Heat weld laps of adhered flashing plies.
3. Exert pressure on the flashing sheet during application to ensure complete contact with the wall/roof surfaces, preventing air pockets. Check and seal all loose laps and edges. Nail the top edge of the flashing on 8 inch centers with specified fasteners or termination bar.

C. Flashing Application - masonry surfaces: Clean and prime surface of masonry prior to installation of flashings.

D. Flashing Application - wood surfaces: Install mechanically fastened base sheet over all wood surfaces prior to torching base ply, with specified capped roofing nails at 6" o.c. in each direction, or set base ply in cold adhesive after cleaning and priming surface of wood. Top ply may be torched or adhered in place, heat weld all laps.

E. Metal surfaces are not acceptable for application of base flashing membrane.

F. Inside and Outside Corners: All corners, inside and out, require a boot to provide positive weather protection at the lap joint. Boot size must be a minimum of 1-1/2 inches radius beyond all intersecting surfaces, and have a minimum of 1/4 inch follow of modified bitumen beyond all edges.

G. Fully bond flashing to substrate. Ensure flashing material conforms and adheres to vertical cant and horizontal substrates.

H. Install three course membrane and mastic over top of secured flashings, extending 2" below fastener caps and 3" above top edge of membrane. Ensure full embedment of membrane in mastic to eliminate voids.

I. At wall surfaces higher than 24" in height, provide single ply flashing membrane fully adhered to plywood or coverboard substrate, extending over parapet wall to lap over and air barrier transition membrane at exterior face 3" minimum.

3.06 METAL FLANGE FLASHINGS (PLUMBING VENTS ONLY)

A. Refer to sheet metal specification for fabrication and installation procedures.

B. Sheet metal flanges shall be 4" wide and flat, without creases or bends.

C. Prime and set flanges in bed of plastic cement at one gallon per 100 linear foot of 4" wide flange.

D. Nail flanges 3" on center and stagger.

E. Prime metal surfaces with asphalt primer on both sides and permit to dry prior to application of modified bitumen flashing strip. Apply asphalt primer at one gallon per 100 sq. feet minimum.

F. Extend modified bitumen flashing strip 4" minimum beyond edge of sheet metal flange.

G. Provide stainless steel mesh set in sealant at the top of all open plumbing vents, to prevent vermin entry.

H. Flanged flashings are prohibited at piping/conduit routed through the roof, and at round vents. Curbs shall be used for these conditions, with base flashing and sheet metal flashings as specified in Section 07 6200 and as indicated in the Drawings.

I. PMMA flashing systems at plumbing vents is also acceptable with the approval of the Architect.

3.07 LIQUID-APPLIED, SINGLE-COMPONENT, PMMA FLASHING SYSTEM APPLICATION:

A. Refer to manufacturer's details drawings, product data sheets and published general requirements for application rates and specific installation instructions

B. Pre-cut polyester reinforcing fleece to conform to roof terminations, transitions and penetrations being flashed. Ensure a minimum 2 in overlap of fleece at side and end-laps. Ensure the completed liquid-applied flashing membrane is fully reinforced.

C. Apply the base coat of liquid-applied flashing resin onto the substrate using a brush or roller, working the material into the surface for complete coverage and full adhesion at 2.0 gallons per square.

D. Immediately apply the reinforcing into the wet base coat of resin. Using a brush or roller, work the into the wet resin while applying the second coat of resin to completely encapsulate the fleece at 2.0 gallons per square, and extend the liquid resin 1 inch beyond the fleece.

E. Allow the liquid membrane to sufficiently cure for then apply the finish coat of resin.

3.08 SCUPPER FLASHING

A. Fabricate scupper flanges with a minimum 4" width, all joints soldered in accordance with Section 07 6200.

B. The primary roof scupper shall be set at 1/2" below the surface of the roof membrane to promote drainage, and a minimum 1/2" per foot tapered insulation shall be present at the sump area of 2'-0" x 4'-0" minimum.

C. Coordinate scupper installation with waterproofer. Scupper opening shall be fully flashed with air barrier transition membrane in accordance with Section 072726 and the Drawings prior to installation of scupper flashings.

D. Install wood nailers at scupper opening, height to match roof system at overflow conditions, height set at 1/2" below surface of roof system at primary conditions.

E. Extend field membrane and base flashing into scupper opening.

F. Clean and prime (as required) all surfaces to receive scupper sleeve, install full bed of sealant at roofing surfaces to receive scupper flange.

G. Secure scupper flange to wood nailers or wood cants and wall surfaces with flat head stainless steel screws at 4" o.c. maximum, or as required to provide a flat substrate for flashings.

H. Install membrane scupper flashings and PMMA liquid flashing in accordance with roof membrane manufacturer requirements. Extend liquid flashing 6" minimum beyond edge of membrane flashings. At primary scuppers, extend liquid flashing to cover 2'-0" x 4'-0" sump area.

3.09 STRUCTURAL PIPE FLASHINGS AND HOSE BIBS

A. Provide liquid applied PMMA flashing system at all structural pipes penetrating the roof for support of rooftop structures and at hose bibs. Refer to “PMMA LIQUID FLASHINGS” for installation procedures.

B. Provide umbrella flashing as specified in Section 07 62 00 over termination of PMMA flashing system.

3.10 KITCHEN EXHAUST FANS

A. Provide a solid curb for roof flashing installation. Vented and/or hinged curbs are unacceptable. Coordinate with mechanical contractor to provide vented extensions for mounting of hinge kits for fan maintenance.

B. Provide PMMA liquid flashings over all roof membrane surfaces within 4’-0” of all kitchen exhaust fans handling grease laden air.

3.11 DAILY SEAL

A. Install temporary water cut-offs at completion of each day's work and remove upon resumption of work.

B. Ensure that water does not flow beneath completed sections of membrane system, including completion of flashings, terminations, and daily seals. When possible, install starting at highest point of project area, working to lowest point.

C. Temporarily seal loose membrane edge with hot asphalt. Exercise caution to ensure that membrane is sealed near drains in manner to prevent water migration below membrane and not to impede drainage.

D. Install primary two-ply night seal beneath daily night seal in such manner to seal both new and existing roof system to roof deck to prevent moisture migration from either old roof or new roof.

E. Install daily night seals by extending new roof membrane beyond insulation and sealing to existing deck surface using hot asphalt.

F. When work is resumed, remove and dispose of membrane where asphalt or other sealants were previously applied before resuming installation.

3.12 WALKPADS

A. Provide and install walkpads in 36” x 36” sections, set in adhesive and heat welded to membrane surface. Provide 3” gaps between walkpads for drainage. Walkpads are required around each mechanical unit requiring maintenance and from roof access points to mechanical units and as shown in the drawings or described in this specification section. At a minimum Contractor shall install walkpads around all motorized equipment (i.e. exhaust fans, mechanical units, condensers, etc.), ladder landings, doors, hose bibs, and roof hatches regardless if not shown in the Drawings.

3.13 FIELD QUALITY CONTROL

A. Provide manufacturer site visit reports as identified in this Section to Owner, Architect, and Roof Consultant.

B. All roof membrane deficiencies i.e., fishmouths, dry laps, irregular or contaminated surfaces, etc. shall be corrected at the direction of the Owner, Architect, and/or Roof Consultant in accordance with manufacturer's recommended procedures at no cost to Owner.

C. Roof Consultant will periodically review installed membrane during construction and at Substantial Completion with a capacitance based moisture meter. In the event that readings indicate suspected wet substrate, Contractor shall remove roofing to confirm the presence of moisture. If moisture is present, a full roof scan will be required at Contractor's expense, and all areas identified as "wet" will be replaced with dry materials by Contractor. Patched areas of roofing shall receive an additional PMMA coating application extending 12' beyond repair area. A final moisture scan shall be provided to verify that all moisture within the roof assembly has been removed, at Contractor's expense.

3.14 ADJUSTING

A. Restore to original condition or replace work or materials damaged during handling of roofing materials.

3.15 CLEANING

A. Remove trash, debris, equipment, and parts from jobsite.

B. Remove stains from roof surfaces, walls, walkways, roof top equipment, and driveways.

3.16 PROTECTION

A. Coordinate work to avoid traffic on completed work.

B. Do not store materials on newly completed roof areas without protection.

C. Where unavoidable, protection for light to medium weight materials or foot traffic shall include a minimum 1" thickness insulation board with a minimum 1/2" plywood board on top, strapped together and/or weighted to resist wind uplift while in use.

END OF SECTION

SECTION 07 6200
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, gutters, and downspouts.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood nailers for sheet metal work.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).

B. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

C. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

E. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

F. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

G. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

H. ASTM B749 - Standard Specification for Lead and Lead Alloy Strip, Sheet, and Plate Products; 2014.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

C. Submit 12 inch long, completely finished units of specified factory-fabricated products exposed as finished work.

1.06 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) requirements and standard details, except as otherwise indicated.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

1.08 WARRANTY

A. Manufacturer’s Warranty: Provide manufacturer’s 20-year, non-prorated warranty covering color fade, chalking and film integrity for all “Kynar 500”: pre-finished metal.

B. Contractor's Warranty: Provide Owner a written warranty which shall warrant sheet metal work to be free of leaks and defects in materials and workmanship for five (5) years after date of final acceptance by Owner.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Sheet Metal Manufacturers
   1. Metal Building Components, Inc.: www.mbci.com
   2. Petersen Aluminum Corporation: www.pac-clad.com
   3. Vincent Brass and Aluminum Company: vincentmetals.com
   4. Substitutions: See Section 01 6000 - Product Requirements

2.02 SHEET MATERIALS

A. Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24 gage, (0.0239 inch) thick base metal.

B. Pre-Finished Galvanized Steel: ASTM A 653/A 653M, with G90/Z275 zinc coating; minimum 0.02 inch thick, 24 gauge base metal, shop pre-coated with PVDF coating.
   1. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
   2. "Kynar 500" or "Duranar 200"
   3. Color: As selected by Architect from manufacturer's full line of colors. Provide custom colors when needed to match other materials shown on the drawings or referenced in the Schedule of Materials and Colors.

C. Aluminum: ASTM B209 (ASTM B209M); 0.032 inch thick; anodized finish of color as selected.
   1. Clear Anodized Finish: AAMA 611 AA-M12C22A41 Class I clear anodic coating not less than 0.7 mils thick.
   2. Color Anodized Finish: AAMA 611 AA-M12C22A42/44 Class I integrally or electrolytically colored anodic coating not less than 0.7 mils thick.

D. Pre-Finished Aluminum: ASTM B209 (ASTM B209M); 0.032 inch thick; plain finish shop pre-coated with fluoropolymer coating.
   1. Fluoropolymer Coating: High Performance Organic Finish, AAMA 2604; multiple coat, thermally cured fluoropolymer finish system.
   2. Color: As selected by Architect from manufacturer's full line of colors. Provide custom colors when needed to match other materials shown on the drawings or referenced in the Schedule of Materials and Colors.

E. Lead: ASTM B749, 2.5 lb/sq ft thick.

F. Stainless Steel: ASTM A666 Type 304, soft temper, 0.015 inch thick; smooth No. 4 finish.

2.03 ACCESSORIES

A. Fasteners: Same material and finish as flashing metal , with soft neoprene washers.
   1. Mechanical Fasteners
      a. Nails: Compatible with material fastened, flathead, wire, barbed, slating type.
      b. Washers: Lead or neoprene.
      c. Screws: Self-tapping sheet metal type compatible with material fastened.
      d. Rivets: Stainless steel and cadmium plated material, closed end, type and size as recommended by sheet metal manufacturer.
      e. Concrete and Masonry Fasteners
         1) Round-head stainless steel screw and neoprene washer with lead expansion anchor, FS FF-S-325, Group IV, Type II.
         2) Acceptable Product: Rawl Plug, The Rawl Plug Company, Inc.

B. Flashing Underlayment

1. Grace Ice and Water Shield, a self-adhering membrane composed of high density, cross-laminated polyethylene film coated on one side with butyl rubber adhesive, and covered with a disposable silicone-coated release sheet, and conforms to the following physical properties:
2. Color: Gray-Black
3. Thickness: 40 mil; ASTM D 3767 Method A

C. Mastic Sealant: One- or Two-Part Polyurethane; non-hardening, non-skinning, nondrying, non-migrating sealant.

D. Bituminous Coating: FS TT-C-494 or SSPC Paint 12, solvent type bituminous mastic, nominally free of sulfur, compounded for 15 mil dry film thickness per coat.

E. Adhesives: Type recommended by flashing sheet manufacturer for waterproof and weather resistant seaming and adhesive application of flashing sheet.

F. Metal Accessories: Sheet metal clips, straps, anchoring devices and similar accessory units as required for installation of work, matching or compatible with material being installed, non-corrosive, size and gauge required for performance.

G. Elastic Flashing Filler: Closed cell polyethylene or other soft closed cell material recommended by elastic flashing manufacturer as filler under flashing loops to ensure movement with minimum stress on flashing sheet.

H. Reglets: Metal or plastic units of type and profile indicated, compatible with flashing indicated, non-corrosive.

I. Flux: Phosphoric acid type, manufacturer's standard. For use with steel or copper: Rosin flux

2.04 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Fabricate cleats of same material as sheet, minimum four inches wide, interlocking with sheet.

C. Form pieces in longest possible lengths.

D. Hem exposed edges on underside 1/2 inch; miter and seam corners.

E. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

F. Lap joints 1-inch minimum. Rivet and solder joints on parts that are to be permanently and rigidly assembled.

G. Expansion Provisions: Where lapped or bayonet type expansion provisions in work cannot be used or would not be sufficiently waterproof or weatherproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant concealed within joints.

H. Sealant Joints: Where movable, non-expansion type joints are indicated or required for proper performance or work, form metal to provide for proper installation of Elastomeric sealant in compliance with SMACNA standards.

I. Tin edges of copper sheet to be soldered; solder shop formed metal joints, and after soldering, remove flux, wipe and wash solder joints clean; provide weathertight joints.

J. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

K. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.

L. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

2.05 FABRICATED ITEMS

A. Coping Cap Flashings:

1. Minimum 24 gauge Kynar 500 pre-finished galvanized steel formed in maximum 10 feet length sheets.
2. Provide expansion slip joints at maximum 10 feet on center.

B. Flashings and Counterflashings:
1. Minimum 24 gauge hot-dip galvanized steel formed in maximum 10 feet lengths.
2. All flashings and counterflashings exposed to view shall be Kynar 500 pre-finished galvanized steel

C. Drip Flashing:
1. Drip flashing shall be minimum 24 gauge Kynar 500 pre-finished galvanized steel formed in maximum 10 ft. lengths.

D. Roof Penetrations and Umbrella Counterflashing: Minimum 24 gauge hot-dip galvanized steel two piece construction, fabricated in accordance with approved shop drawings.

E. Metal Edge:
1. Minimum 24 gauge Kynar 500 pre-finished galvanized steel formed in maximum 10 ft. lengths.
2. Provide expansion slip joints at maximum 10 ft. on center.

F. Continuous Cleats: 22ga. continuous strips, hot dipped galvanized sheet metal.

G. Vent Pipe, Heat Vent Hoods, Sleeves, Pitch Pans, and Accessories: Minimum 24 gauge pre-finished, or hot-dip grip galvanized steel.

H. Gutters, Downspouts and Scupper Sleeves: Minimum 24 gauge Kynar 500 pre-finished galvanized steel. Lap joints minimum 3 inch. Seal laps with structural sealant and rivet. Coordinate downspouts with steel boots per drawings. Provide expansion joints in gutters per SMACNA guidelines, 50'-0" o.c. max. Gutters to be provided with gutter screens.

I. Downspout Boots shall be fabricated as specified in Section 05 5000 and as detailed on the drawings.

J. Expansion and Control Joints: 24 gauge hot-dip galvanized steel formed in 10 ft. maximum lengths where possible. Fabricate in accordance with SMACNA reference details, Ref. Plate 5-5a, 5-5b for field installations; Ref. Plates 5-6a & 5-6b for wall conditions.

K. Vent Stack, Soil Vent, Flashing: 4 pound lead. Fabricate and install in accordance with approved shop drawings.

L. Vent Pipe Flashing: 24 gauge hot-dip galvanized steel.

M. Roof Drain Flashing: 2.5 pound lead sheet, minimum 36” x 36” square. Fabricate and install as shown in NRCA Roofing and Waterproofing Manual.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Install surface mounted reglets true to lines and levels, and seal top of reglets with sealant.

C. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.03 INSTALLATION

A. Install sheet metal with lines, arises, and angles sharp and true, and plane surfaces free from objectionable wave, warp, or buckle. Exposed edges of sheet metal shall be folded back to form ¼ inch hem on concealed side from view. Finished work shall be free from water retention and leakage under all weather conditions. Pre-fabricated corners or transitions are required at changes in direction, elevation, or plane and at intersections. Locate field joints not less than 12 inches, nor more than 3 feet from actual corner. Laps shall be 1 inch, riveted and soldered at following locations: Prefabricated corners; transitions; changes in direction, elevation, and plane; and at intersections.

B. Anchor units of work securely in place to prevent damage or distortion from wind or buckling. Provide for thermal expansion of metal units; conceal fasteners where possible; and set units true to line and level as indicated. Install work with laps, joints and seams which are permanently watertight and weather proof.

C. Install fabricated sheet metal items in accordance with manufacturer's installation instructions and recommendations and with SMACNA Architectural Sheet Metal Manual.

D. Separations: Provide for separation of metal from non-compatible metal or corrosive substrates by coating concealed surfaces with zinc chromate, bituminous coating, or other permanent separation at locations or contact as recommended by manufacturer or fabricator. Do not use materials incompatible with roofing system.

E. Continuous Cleat: At exposed edges of gravel guards, fascias, coping cap and metal edge gravel guard and where required otherwise, attach galvanized continuous cleat nailed staggered at six (6) inches on center. Nails shall be annular threaded galvanized nails, with a minimum of 1.5 inches in length, and seated on the vertical flange of the cleat. Cleat shall be one gauge heavier than adjacent sheet metal item or a minimum of 22 gauge.

F. Flanges: Bed flanges of work in thick coat of bituminous roofing cement where required for waterproof performance.

G. Coping: Minimum 24 gauge pre-finished galvanized steel.

H. Coping Cap Flashings
   1. Install over underlayment and slip sheet.
   2. Lock bottom flanges to edge strips.
   3. Join sheets in accordance with SMACNA details.
   4. Fasten back of coping with fasteners and neoprene washers 8 inches on center through pre-drilled slotted holes.

I. Flashings and Counterflashings
   1. Extend flanges into reglet and securely fasten.
   2. Where nailing is required, nail at 6 inches on center.
   3. Overlap 4 inches on base flashing; lap ends at 3 inches.
   4. Or, depending on other construction, install counterflashing in reglets, either by snap in seal arrangement or by wedging in place with lead wedges at 8 inches on center for anchorage and filling reglet with elastomeric sealant as indicated and as required for specific exposure.
   5. All sheet metal counterflashing shall include a galvanized hook strip, placed a minimum of three feet on center or as required by local code or wind uplift requirement.

J. Metal Edge
   1. Install with allowance for movement between sections and seal with six (6) inch minimum cover plates.
   2. Extend flanges 4 inches onto roof surface.
   3. Install sealant between flange and substrate.
   4. Fasten 3 inches on center in two staggered rows.

K. Roof Penetration Hoods and Umbrella Counterflashings
   1. Install watertight hood or umbrella counterflashing at sleeves and penetration locations, such as pipes and conduit penetration roof, and at equipment supports and over pitch pans.
   2. Set umbrella counterflashing in sealant.
   3. Fully solder connections and seams and install in accordance with approved shop drawings.
   4. Tighten draw bands.
   5. Seal top of umbrella counterflashing with sealant.

L. Reglets
   1. Install reglets to receive counterflashing in manner and by methods indicated.
   2. Where shown in concrete, furnish reglets to trades of concrete work for installation as part of work in Division 3 Sections.
   3. Where shown in masonry, furnish reglets to trades of masonry work for installation as part of work in Division 4 Sections.

M. Expansion Joint Flanges
   1. Nail flanges of expansion joint units to curb nailers at maximum spacing of 6 inches.
   2. Fabricate seams at joints between units with minimum 3 inches overlap to form continuous waterproof system.

N. Drip Flashing
   1. Install over Rosin Paper.
   2. Furnish drip flashing to trades of masonry work for installation as part of work in specifications, Division 04 Sections.

O. Rooftop Unit Receiver Trim
   1. Install receiver flashing at rooftop units. Receiver clip shall allow RTU to be set on curb prior to roof membrane installation. Refer to drawings for detail.

3.04 CLEANING

A. Remove flux and residual acid immediately by neutralizing with baking soda and washing with clean water. Leave work clean and free of stains, scrap, and debris.

B. Clean exposed metal surfaces, removing substances which might cause corrosion of metal or deterioration of finishes.

C. Prime soldered area of phosphatized metal after cleaning to prevent rusting.

3.05 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for field inspection requirements.

B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

END OF SECTION

SECTION 07 7200
ROOF ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured curbs and equipment rails.

B. Roof hatches.

C. Pipe Stands.

1.02 RELATED REQUIREMENTS

A. Section 05 3100 - Steel Decking.

B. Section 07 6200 - Sheet Metal Flashing and Trim: Roof accessory items fabricated from sheet metal.

1.03 REFERENCE STANDARDS

A. FM (AG) - FM Approval Guide; current edition.

B. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used.
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Maintenance requirements.
   5. For smoke hatches, submit evidence of approval by evaluation agency specified.

C. Certificate: For smoke hatches, provide certificate of approval from authority having jurisdiction.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Remove protective wrapping immediately after installation.

C. Store products under cover and elevated above grade.

D. The contractor shall thoroughly inspect product upon receipt and report damaged material immediately to delivering carrier and note such damage on the carrier’s freight bill of lading.

1.06 WARRANTY

A. Comply with requirements of Section 01 7800 – Closeout Submittals.

B. Submit a written warranty, executed by the Contractor, Installer, and Manufacturer, agreeing to repair or replace roof accessories that fail in materials or workmanship within the specified warranty period.
   1. Roof Scuttle Warranty Period: Five (5) years after date of Substantial Completion.
   2. Automatic Smoke/Fire Vent Warranty Period: Five (5) years after date of Substantial Completion.
   3. Roof Pipe Stands Warranty Period: One (1) year after date of Substantial Completion.

PART 2 PRODUCTS

2.01 ROOF CURBS

A. Manufacturers:
   1. Thybar Corporation: www.thybar.com.

2. Substitutions: See Section 01 6000 - Product Requirements.

B. Roof Curbs Mounting Assemblies: Factory fabricated hollow sheet metal construction, internally reinforced, and capable of supporting superimposed live and dead loads and designated equipment load with fully mitered and sealed corner joints welded or mechanically fastened, and integral counterflashing with top and edges formed to shed water.
   1. Roof Curb Mounting Substrate: Curb substrate consists of standing seam metal roof panel system.
   2. Sheet Metal Material:
      a. Aluminum: 0.080 inch minimum thickness, with 3003 alloy, and H14 temper.
   3. Galvanized Steel: Hot-dip zinc coated steel sheet complying with ASTM A653/A653M, SS Grade 33; G60 coating designation; 18 gage, 0.048 inch thick.
   4. Fabricate curb bottom and mounting flanges for installation directly on metal roof panel system to match slope and configuration of system.
      a. Extend side flange to next adjacent roof panel seam and comply with seam configurations and seal connection, providing at least 6 inch clearance between curb and metal roof panel flange allowing water to properly flow past curb.
      b. Where side of curb aligns with metal roof panel flange, attach fasteners on upper slope of flange to curb connection allowing water to flow past below fasteners, and seal connection.
      c. Maintain at least 12 inch clearance from curb, and lap upper curb flange on underside of down sloping metal roof panel, and seal connection.
      d. Lap lower curb flange overtop of down sloping metal roof panel and seal connection.
   5. Provide layouts and configurations indicated on drawings.
   6. Curb shall be sized to allow space for flashing. Reference drawings for flashing detail. Roof curb shall allow for units to be set prior to roof material completion. Coordinate curb size with Mechanical drawings.

C. Curbs Adjacent to Roof Openings: Provide curb on each side of opening, with top of curb horizontal for equipment mounting.
   1. Provide preservative treated wood nailers along top of curb.
   2. Insulate inside curbs with 1-1/2 inch thick fiberglass insulation.
   3. Height Above Roof Deck: 18 inches, minimum.
   4. Model TC-2 for equipment support curbs.
   5. Model TC-3 for roof curbs.

D. Equipment Rail Curbs: Straight curbs on each side of equipment, with top of curbs horizontal and level with each other for equipment mounting.
   1. Equipment supports shall span a minimum of two structural members.
   2. Model TEMS-3 for equipment rails

2.02 ROOF HATCHES

A. Roof Hatch Manufacturers:
   1. Babcock-Davis: www.babcockdavis.com/sle.
   2. Bilco Company: www.bilco.com/sle.
   3. Elmdor Stonemen: www.elmdorstoneman.com/#sle.
   4. Milcor, Inc: www.milcorinc.com.
   5. Nystrom, Inc: www.nystrom.com/#sle.
   6. Substitutions: See Section 01 6000 - Product Requirements.

B. Roof Hatches and Smoke Vents: Factory-assembled aluminum frame and cover, complete with operating and release hardware.
   1. Style: Provide flat metal covers unless otherwise indicated.

a. Basis of Design: Bilco Scuttle Type S, size width: 3'-0" x length: 2'-6". Length denotes hinge side. The roof scuttle shall be single leaf. The roof scuttle shall be pre-assembled from the manufacturer.

2. Mounting: Provide frames and curbs suitable for mounting conditions as indicated on drawings.

C. Frames and Curbs: One-piece curb and frame with integral cap flashing to receive roof flashings; extended bottom flange to suit mounting.
1. Insulation: Manufacturer's standard; 1 inch rigid glass fiber, located on outside face of curb.
2. Curb Height: 12 inches from finished surface of roof, minimum.

D. Metal Covers: Flush, insulated, hollow metal construction.
1. Capable of supporting 40 psf live load.
2. Insulation: Manufacturer's standard 1 inch rigid glass fiber.
3. Gasket: EPDM, continuous around cover perimeter.
4. Entire scuttle shall be weather tight with fully welded corner joints on cover and curb.

E. Safety Railing System: Manufacturer's standard accessory safety rail system mounted directly to curb. Provide where hatch is located within 10' of the roof edge or as required by OSHA standards.
1. Comply with 29 CFR 1910.23, with a safety factor of two.
2. Posts and Rails: Fiberglass reinforced polymer.
3. Gate: Same material as railing; automatic closing with latch.
4. Finish: Manufacturer's standard; molded in integral safety yellow.
5. Gate Hinges and Post Guides: ASTM B221 (ASTM B221M), 6063 alloy, T5 temper aluminum.
6. Mounting Brackets: Hot dipped galvanized steel, 1/4 inch thick, minimum.
7. Fasteners: Stainless steel, Type 316.

F. Hardware: Steel, zinc coated and chromate sealed, unless otherwise indicated or required by manufacturer.
1. Lifting Mechanisms: Compression spring operator with shock absorbers that automatically opens upon release of latch; capable of lifting covers despite 10 psf load.
2. Hinges: Heavy duty pintle type.
3. Hold open arm with vinyl-coated handle for manual release.
4. Latch: Upon closing, engage latch automatically and reset manual release.
5. Manual Release: Pull handle on interior.
6. Locking: Padlock hasp on interior.

2.03 PIPE STANDS

A. Acceptable Manufacturers: Subject to compliance with requirements herein, provide products from one of the following manufacturers.
1. Miro Industries, Inc.: www.miroind.com.
2. MAPA Products: www.mapaproducts.com.
3. Portable Pipe Hangers: www.phpsd.com.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Gas Piping
1. Provide a "roller-bearing" pipe support used to support roof-mounted gas piping. Pipes rest on a self-lubricating roller system which is made of a stainless steel rod and a sturdy polycarbonate resin roller. The pipe support base is made of polycarbonate resin, the roller rod is made of glass-filled nylon, and all metal parts are made of stainless steel. Pipe stand will accommodate up to 4" pipe (inside diameter) up to 5" outside diameter pipes. Pipes shall be supported at a minimum distance of 6” off of the roof deck.
2. Product Requirements

a. Load Weight: Maximum load weight may not exceed 125 lbs. per pipestand.
b. Model Number: 4-RAH – Miro Industries
c. Size: Base - 9" x 15.12", with adjustment from 2.75" to 7.0" above roof membrane.
d. Spacing: Not to exceed ten (10) foot centers.

C. Condensate Piping
1. Provide a threaded rod "clamp" pipe support used to support roof-mounted condensate piping. Pipes are stabilized by a rubber cushion provides vibration isolator. System is made of a stainless steel rod and pipe clamp. The pipe support base is made of Molded 33% Fiberglass Reinforced 6/6 nylon. Support pad is .125 ml black Neoprene.
2. Pipe stand will accommodate up to 2" copper pipe. Pipes shall be supported at a minimum distance of 6” off of the roof deck.
3. Product Requirements
a. Load Weight: Maximum load weight may not exceed 75 lbs. per pipestand.
b. Model Number: MS-1 – MAPA Products
c. Threaded rod: 3/8” - Grade 304 SS ATR
d. Size: Base – 8” Octagonal, with an adjustment from 6" to 10" above roof membrane.
e. Spacing: Not to exceed ten (10) foot centers.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using methods recommended by manufacturer for achieving acceptable results for applicable substrate under project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.

B. Pipe Stands
1. Pipe stand shall be adjusted in height to distribute load evenly.
2. Provide an additional sheet of roofing material under all pipe stands.
3. All loose aggregate shall be removed from the area directly beneath the pipe stand.
4. Adhere bases to roof membrane manufacturer approved protection pads in accordance with roof membrane manufacturer’s installation requirements.

3.04 CLEANING

A. Clean installed work to like-new condition.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 07 8100
APPLIED FIRE PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fireproofing of interior structural steel not exposed to damage or moisture.

B. Preparation of fireproofing for application of exposed finish specified elsewhere.

1.02 RELATED REQUIREMENTS

A. Section 01 1400 - Work Restrictions

B. Section 01 4533 - Code-Required Quality Control

C. Section 05 1200 - Structural Steel Framing.

D. Section 05 2100 - Steel Joist Framing.

E. Section 05 3100 - Steel Decking.

F. Section 07 8400 - Firestopping.

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023.

B. ASTM E605/E605M - Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members; 2019 (Reapproved 2023).

C. ASTM E736/E736M - Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members; 2019 (Reapproved 2023).

D. ASTM E759/E759M - Standard Test Method for Effect of Deflection on Sprayed Fire-Resistive Material Applied to Structural Members; 1992 (Reapproved 2023).

E. ASTM E760/E760M - Standard Test Method for Effect of Impact on Bonding of Sprayed Fire-Resistive Material Applied to Structural Members; 1992 (Reapproved 2023).

F. ASTM E859/E859M - Standard Test Method for Air Erosion of Sprayed Fire-Resistive Materials (SFRMs) Applied to Structural Members; 2023.

G. ASTM E937/E937M - Standard Test Method for Corrosion of Steel by Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members; 1993 (Reapproved 2023).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with placement of ceiling hanger tabs, mechanical component hangers, and electrical components.

B. Preinstallation Meeting: Convene two before starting work of this section.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittals procedures.

B. Product Data: Provide data indicating product characteristics, performance criteria, and limitations of use.

C. Test Reports: Reports from reputable independent testing agencies for proposed products, indicating compliance with specified criteria, conducted under conditions similar to those on project, as follows:
   1. Bond strength.
   2. Bond impact.
   3. Compressive strength.
   4. Fire tests using substrate materials similar those on project.

D. Manufacturer's Installation Instructions: Indicate special procedures.

E. Manufacturer Reports: Indicate environmental conditions that applied fireproofing materials were installed.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience
   1. Having minimum five years of documented experience.

1.07 MOCK-UP

A. Construct mock-up, 100 square feet in size.

B. Comply with project requirements for fire ratings, thickness, density of application, and code compliance.

C. Locate where directed.

D. Examine installation within one hour of application to determine variances from specified requirements due to shrinkage, temperature, and humidity.

E. Where shrinkage and cracking are evident, adjust mixture and method of application as necessary; remove materials and re-construct mock-up.

F. Mock-up may remain as part of the Work.

1.08 FIELD CONDITIONS

A. Do not apply fireproofing when temperature of substrate material and surrounding air is below 40 degrees F or when temperature is predicted to be below said temperature for 24 hours after application.

B. Provide ventilation in areas to receive fireproofing during application and 24 hours afterward, to dry applied material.

C. Provide temporary enclosure to prevent spray from contaminating air.

D. Do not allow roof traffic during installation of roof fireproofing and drying period.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a two year period after Date of Substantial Completion.
   1. Include coverage for fireproofing to remain free from cracking, checking, dusting, flaking, spalling, separation, and blistering.
   2. Reinstall or repair failures that occur within warranty period.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Applied Fireproofing:
   1. Carboline Company: www.carboline.com.
   2. GCP Applied Technologies: www.gcpat.com/fireproofing.
   3. Isolatek International Corp: www.isolatek.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FIREPROOFING ASSEMBLIES

A. Provide assemblies as indicated on drawings.

2.03 MATERIALS

A. Sprayed Fire-Resistive Material for Interior Applications, Concealed: Manufacturer's standard factory mixed material, which when combined with water is capable of providing the indicated fire resistance, and conforming to the following requirements:
   1. Bond Strength: 150 pounds per square foot, minimum, when tested in accordance with ASTM E736/E736M when set and dry.
   2. Dry Density: Minimum average density of 15 lb/cu ft, with minimum individual density of any test sample of 14 lb/cu ft, when tested in accordance with ASTM E605/E605M.
   3. Compressive Strength: 8.33 pounds per square inch, minimum.
   4. Effect of Impact on Bonding: No cracking, spalling or delamination, when tested in accordance with ASTM E760/E760M.
   5. Corrosivity: No evidence of corrosion, when tested in accordance with ASTM E937/E937M.
   6. Air Erosion Resistance: Weight loss of 0.025 g/sq ft, maximum, when tested in accordance with ASTM E859/E859M after 24 hours.
   7. Surface Burning Characteristics: Maximum flame spread index of 0 (zero) and maximum smoke developed index of 0 (zero), when tested in accordance with ASTM E84.
   8. Effect of Deflection: No cracking, spalling, or delamination, when tested in accordance with ASTM E759/E759M.

2.04 ACCESSORIES

A. Primer Adhesive: Of type recommended by applied fireproofing manufacturer.

B. Overcoat: As recommended by manufacturer of applied fireproofing material.

C. Metal Lath: Expanded metal lath; minimum 3.4 pounds per square foot, galvanized finish.

D. Water: Clean, potable.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive fireproofing.

B. Verify that clips, hangers, supports, sleeves, and other items required to penetrate fireproofing are in place.

C. Verify that ducts, piping, equipment, or other items that would interfere with application of fireproofing have not been installed.

D. Verify that voids and cracks in substrate have been filled.

E. Verify that projections have been removed where fireproofing will be exposed to view as a finish material.

3.02 PREPARATION

A. Perform tests as recommended by fireproofing manufacturer in applications where adhesion of fireproofing to substrate is in question.

B. Remove incompatible materials that could effect bond by scraping, brushing, scrubbing, or sandblasting.

C. Prepare substrates to receive fireproofing in strict accordance with instructions of fireproofing manufacturer.

D. Apply fireproofing manufacturer's recommended bonding agent on primed steel.

E. Protect surfaces not scheduled for fireproofing and equipment from damage by overspray, fall-out, and dusting.

F. Close off and seal duct work in areas where fireproofing is being applied.

3.03 APPLICATION

A. Install metal lath over structural members as indicated or as required by UL Assembly Design Numbers.

B. Apply primer coating, fireproofing, and overcoat in accordance with manufacturer's instructions.

C. Apply fireproofing in uniform thickness and density as necessary to achieve required ratings.

D. In exposed locations, trowel surface smooth and form square edges, using tools and procedures recommended by fireproofing manufacturer.

E. Apply overcoat at the rate recommended by fireproofing manufacturer.

3.04 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01 4000 - Quality Requirements.

B. The owner will employ an independent agency to randomly sample and verify the thickness and the density of the fireproofing in accordance with the provisions of ASTM E605 and verify the bond strength of the fireproofing in accordance with ASTM E736.

C. Inspect installed fireproofing after application and curing for integrity, prior to its concealment.

D. Ensure that actual thicknesses, densities, and bond strengths meet requirements for specified ratings and requirements of authorities having jurisdiction (AHJ).

E. Re-inspect installed fireproofing for integrity of fire protection, after installation of subsequent Work.

3.05 CLEANING

A. Remove excess material, overspray, droppings, and debris.

B. Remove fireproofing from materials and surfaces not required to be fireproofed.

C. At exposed fireproofing, clean surfaces that have become soiled or stained, using manufacturer's recommended procedures.

END OF SECTION

SECTION 07 8123
INTUMESCENT FIRE PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Thin-film intumescent mastic fireproofing.

B. Protective and/or decorative topcoats.

1.02 RELATED REQUIREMENTS

A. Section 01 1400 - Work Restrictions

B. Section 01 4533 - Code-Required Quality Control

C. Section .

D. Section .

E. Section 09 9000 - Painting and Coating: Field-applied paints matching intumescent fireproofing.

1.03 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2015 (Reapproved 2021).

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittals procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Performance characteristics and test results.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Installation methods.

C. Selection Samples: For decorative top coat, color chips representing manufacturer's full range of available colors and sheens.

D. Verification Samples: For each thickness, color, sheen, and finish required, submit samples not less than 4 inch square on designated substrate illustrating finished appearance.

E. Certificates: Certify that intumescent fireproofing provided for this project meets or exceeds specified requirements in all respects.
   1. Extrapolation of member size and/or material thickness shown in the individual designs are not acceptable.

F. Test Reports: Published fire resistive designs for structural elements of the types required for the project, indicating hourly ratings of each assembly.

G. Field Quality Control Submittals: Submit field test report.

H. Manufacturer's Qualification Statement.

I. Installer's Qualification Statement.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company that specializes in manufacturing the type of products specified, with minimum of ten years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified of similar size and scope and with at least five years of documented experience.

C. Mock-up
   1. Provide a mock-up for evaluation of surface preparation techniques and application workmanship; approved mock-up will serve as a standard of comparison for subsequent work of this section.
   2. Finish at least 100 sq ft of surface in areas as designated by Architect.
   3. Evaluate mock-up for compliance with specified requirements, including thickness and finish texture.
   4. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
   5. Refinish mock-up area as required to produce acceptable work.
   6. Approved mock-up may remain as part of the project.

1.06 PRE-INSTALLATIONS CONFERENCE

A. Conduct pre-installation conferences at Project site prior to commencing work.

B. Attendees:
   1. Project Superintendent: presides over meeting and is responsible for minutes.
   2. Subcontractor (fireproofing)
   3. Manufacturer's technical representative
   4. Other directly affecting, or affected by work
   5. Testing agency
   6. Owner representative

C. Agenda:
   1. Access to work and conditions of proper installation
   2. Conditions of installation, such as substrates, existing and surrounding conditions, and environmental conditions,
   3. Conditions detrimental to installation
   4. Preparation procedures, including protection of adjacent work.
   5. Verify installer's receipt and understanding of installation instructions.
   6. Review submittals, installation procedures, and sequence.
   7. Review coordination with other work.
   8. Evaluate delivery schedule and construction progress schedule
   9. Observe sample installation
   10. Required protection procedures.
   11. Observe actual installation areas.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer’s original, unopened containers with identification labels and testing agency markings intact and legible.

B. Store products in manufacturer's unopened packaging until ready for installation.
   1. Store at temperatures not less than 50 degrees F in dry, protected area.
   2. Protect from freezing, and do not store in direct sunlight.
   3. Dispose of any materials that have come into contact with contaminants of any kind prior to application.

C. Dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.08 FIELD CONDITIONS

A. Protect areas of application from windblown dust and rain.

B. Maintain ambient field conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under ambient conditions outside manufacturer's absolute limits.
   1. Provide temporary enclosures as required to control ambient conditions.
   2. Do not apply intumescent fireproofing when ambient temperatures are below 50 degrees F without specific approval from manufacturer.
   3. Maintain relative humidity between 40 and 60 percent in areas of application.
   4. Maintain ventilation in enclosed spaces during application and for not less than 72 hours afterward.

1.09 SEQUENCING

A. Sequence and coordinate application of intumescent coatings with related work specified in other Sections to comply with the following requirements:
   1. Coordinate installation of intumescent coatings with other items of work that may interfere with proper installation of coatings.
   2. Do not begin applying intumescent coatings until clips, hangers, supports, and other welded connections have been installed. Intumescent coatings manufacturer must approve in writing any clips, hangers, supports or connections that may installed over coating using mechanical or adhesive devices.
   3. Provide temporary enclosures as necessary to prevent deterioration of intumescent coatings due to exposure to unfavorable environmental conditions as required by installation procedures and product performance capabilities as supplied by manufacturer. Exposure to exterior elements for any portion of construction cycle must be supported a verified burn test to ensure no degradation of fire properties.
   4. Take appropriate steps to avoid abrasion and other damage to the applied intumescent coatings during construction operations.
   5. Do not protect or conceal structural members to which intumescent coatings have been applied until each area has been inspected, tested, and corrections have been made to any deficient areas.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Intumescent Mastic Fireproofing:
   1. Albi Manufacturing Division of StanChem Inc: www.albi.com.
   2. Carboline Company: www.carboline.com.
   3. Hilti, Inc: www.us.hilti.com/steel-protection.
   4. Isolatek International Corp: www.isolatek.com/#s
   5. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
   6. Substitutions: See Section 01 6000 - Product Requirements.

2.02 SYSTEM REQUIREMENTS

A. Fireproofing: Provide intumescent thin-film fire resistive coating systems tested by an independent testing agency in accordance with full scale ASTM E119 and acceptable to authorities having jurisdiction (AHJ).
   1. Provide assemblies listed by UL, ULC, ITS/WH, or FMand bearing listing agency label or mark.

B. Structural Steel Columns: Fire resistance rating as noted on the drawings.

C. Structural Steel Beams: Fire resistance rating as noted on the drawings.

D. Structural Steel Beams and Exposed Steel Deck: Fire resistance rating as noted on the drawings.

E. Exposed Steel Deck: Fire resistance rating as noted on the drawings.

2.03 MATERIALS

A. Fire Resistive Coating System: Thin film intumescent mastic fireproofing system for fire protection of structural steel, concrete, concrete masonry units (CMU), and and other items as indicated on the drawings.
   1. Surface Burning Characteristics: Tested in accordance with ASTM E84.
      a. Flame Spread Index (FSI): 25, maximum.
      b. Smoke Developed Index (SDI): 50, maximum.
   2. For Interior Use:
      a. Use only water-based products.
      b. VOC Content: Less than 50 g per L when tested in accordance with 40 CFR 59, Subpart D (EPA Method 24).
      c. Durometer Hardness, Type D: 39, minimum, in accordance with ASTM D2240.
   3. For Exterior Use:
      a. Use only solvent-based products.
      b. VOC Content: Less than 125 g per L when tested in accordance with 40 CFR 59, Subpart D (EPA Method 24).
      c. Durometer Hardness, Type D: 39, minimum, in accordance with ASTM D2240.

2.04 AUXILIARY FIREPROOFING MATERIALS

A. General: Provide auxiliary fireproofing materials that are compatible with intumescent coating products and substrates and are approved by UL or other accredited testing agencies acceptable to authorities having jurisdiction for use in the fire resistive designs indicated.

B. Substrate Primers: For use on each different substrate, provide primer that complies with the following requirements:
   1. Primer approved in writing by manufacturer of intumescent coatings and applied in full compliance with the primer manufacturer’s recommendations.
   2. Primer to have been tested by manufacturer in fire conditions to ensure fire-performance of primer-intumescent system, and adhesion of the post-burn intumescent char to the primer. Documentation of such tests to be provided upon request.
   3. Primer must be fully cured prior to installation of the intumescent coating.

C. Topcoats: Suitable for application over applied intumescent coatings; of type recommended in writing by intumescent coatings manufacturer for each fire resistance design. Topcoat to have been tested by manufacturer for compatibility in fire conditions with documentation of such tests to be provided upon request. Color of topcoat shall be as selected by the architect. Colors shall not be limited to manufacturer's standard colors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates to determine if they are in satisfactory condition to receive intumescent fireproofing; verify that substrates are clean and free of oil, grease, incompatible primers, or other foreign substances capable of impairing bond to fireproofing system.

B. Do not begin installation until substrates have been properly prepared.

C. If substrate preparation is responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Cover other work subject to damage from fall out or overspray of intumescent coatings materials during application. Provide temporary enclosure as required to confine spraying operations, protect the environment, and ensure maintaining adequate ambient conditions for temperature and ventilation.

B. Thoroughly clean surfaces to receive fireproofing that could impair bond of fireproofing, including oil, grease, rolling compounds, incompatible primers, rust, and mill scale.

C. Repair substrates to remove surface imperfections that could effect uniformity of texture and thickness of fireproofing system, and remove minor projections and fill voids that could telegraph through finished work.

D. Cover or otherwise protect other work that might be damaged by fallout or overspray of fireproofing system, and provide temporary enclosures as necessary to confine operations and maintain required ambient field conditions.

3.03 APPLICATION

A. Coordinate application of intumescent coatings with other construction to allow for proper application and minimize need to repair damage.

B. Comply with manufacturer's instructions for particular conditions of installation applications.

C. Apply manufacturer’s recommended primer to required coating thickness. Prime substrates with an approved and compatible primer, unless an approved and compatible shop primer has been applied and is in satisfactory condition to receive intumescent coatings. Primer must be fully cured prior to applying intumescent coatings.

D. Apply fireproofing to full thickness over entire area of each substrate to be protected.

E. Apply coats at manufacturer’s recommended rate to achieve dry film thickness (DFT) as required for fire resistance ratings designated for each condition. Protect intumescent coatings from rain, direct sunlight, high humidity, strong wind (with dirt, dust or sand) during the application, drying, and curing phases, unless test evidence allows otherwise. Do not apply an additional coat of intumescent coating until previous layer has fully cured.

F. Apply intumescent fireproofing by spraying to maximum extent possible, and as necessary complete coverage by roller application or other method acceptable to manufacturer.

G. For applications visible upon completion of project, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of fireproofing. Remove minor projections that would telegraph through fire resistive products after application.

H. Achieve uniform finished appearance complying with approved mock-up.

3.04 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01 4000 - Quality Requirements.
   1. Arrange for testing of installed intumescent mastic fireproofing by an independent testing laboratory using magnetic pull-off dry film thickness gage in accordance with SSPC-PA 2, and ensure it meets requirements of authorities having jurisdiction (AHJ).
   2. Submit field test reports promptly to Contractor and Architect.

B. Repair or replace intumescent mastic fireproofing at locations where test results indicate fireproofing does not meet specified requirements.

3.05 CLEANING

A. Immediately after installation of fireproofing in each area, remove overspray and fallout from other surfaces and clean soiled areas.

3.06 PROTECTION

A. Protect installed intumescent mastic fireproofing from damage due to subsequent construction activities, so fireproofing is without damage or deterioration before Date of Substantial Completion.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 07 8400
FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Firestopping systems.

B. Firestopping of all joints and penetrations in fire-resistance rated and smoke-resistant assemblies .

1.02 RELATED REQUIREMENTS

A. Section 01 1400 - Work Restrictions

B. Section 01 4533 - Code-Required Quality Control

C. Section 01 7000 - Execution and Closeout Requirements: Cutting and patching.

D. Section 09 2982 - Gypsum Board: Gypsum wallboard fireproofing.

1.03 REFERENCE STANDARDS

A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2022.

B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).

C. ASTM E2307 - Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus; 2015b, with Editorial Revision (2016).

D. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015 (Reapproved 2021)e1.

E. FM (AG) - FM Approval Guide; current edition.

F. FM 4991 - Approval Standard for Firestop Contractors; 2013.

G. ITS (DIR) - Directory of Listed Products; current edition.

H. SCAQMD 1168 - Adhesive and Sealant Applications; 1989, with Amendment (2022).

I. UL (FRD) - Fire Resistance Directory; Current Edition.

J. UL 1479 - Standard for Fire Tests of Penetration Firestops; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.

C. Product Data: Provide data on product characteristics, performance ratings, and limitations.

D. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Certificate from authority having jurisdiction indicating approval of materials used.

G. Installer Qualification: Submit qualification statements for installing mechanics.

1.05 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with ASTM E119 and ASTM E814.

1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.
2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at www.icc-es.org will be considered as constituting an acceptable test report.
3. Submission of actual test reports is required for assemblies for which none of the above substantiation exists.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section and:
1. Approved by Factory Mutual Research Corporation under FM 4991

1.06 FIELD CONDITIONS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.

B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Firestopping Manufacturers:
1. 3M Fire Protection Products: www.3m.com/firestop/#sle.
2. A/D Fire Protection Systems Inc: www.adfire.com/#sle.
3. Everkem Diversified Products, Inc: www.everkemproducts.com/#sle.
4. Hilti, Inc: www.us.hilti.com/#sle.
5. Nelson FireStop Products: www.nelsonfirestop.com/#sle.
6. Specified Technologies Inc: www.stifirestop.com/#sle.
7. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
8. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Firestopping Materials: Any materials meeting requirements.

B. Volatile Organic Compound (VOC) Content: Provide products having VOC content lower than that required by SCAQMD 1168.

C. Mold and Mildew Resistance: Provide firestoppping materials with mold and mildew resistance rating of zero(0) in accordance with ASTM G21.

D. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

E. Fire Ratings: Refer to drawings for required systems and ratings.

2.03 FIRESTOPPING ASSEMBLY REQUIREMENTS

A. Perimeter Fire Containment Firestopping: Use system that has been tested according to ASTM E2307 to have fire resistance F Rating equal to required fire rating of floor assembly.

B. Head-of-Wall Joint System Firestopping at Joints Between Fire-Rated Wall Assemblies and Non-Rated Horizontal Assemblies: Use system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of floor or wall, whichever is greater.

C. Floor-to-Floor, Wall-to-Wall, and Wall-to-Floor Joints, Except Perimeter, Where Both Are Fire-Rated: Use system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.

D. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.

2.04 FIRESTOPPING SYSTEMS

A. Firestopping: Any material meeting requirements.
   1. Fire Ratings: Use system that is listed by FM (AG), ITS (DIR), or UL (FRD) and tested in accordance with ASTM E814, ASTM E119, or UL 1479 with F Rating equal to fire rating of penetrated assembly and minimum T Rating Equal to F Rating and in compliance with other specified requirements.

B. Sealants or caulking materials for use with non-combustible items including steel pipe, copper pipe, rigid steel conduit and electrical metallic tubing (EMT), the following products are acceptable:
   1. Hilti FS-ONE Intumescent Firestop Sealant
   2. Hilti CP 604 Self-Leveling Firestop Sealant
   3. Hilti CP 620 Fire Foam
   4. Hilti CP 606 Flexible Firestop Sealant
   5. Hilti CP 601s Elastomeric Firestop Sealant
   6. 3M Fire Stop Sealant 2000
   7. 3M Fire Barrier CP25 WB
   8. Tremco Tremstop Fyre-Sil Sealant

C. Sealants or caulking materials for use with sheet metal ducts, the following products are acceptable:
   1. Hilti CP 601s Elastomeric Firestop Sealant
   2. Hilti CP 606 Flexible Firestop Sealant
   3. Hilti FS-ONE Intumescent Firestop Sealant

D. Sealants, caulking or spray materials for use with fire-rated construction joints and other gaps, the following products are acceptable:
   1. Hilti CFS-SP WB Firestop Joint Spray
   2. Hilti CP 601s Elastomeric Firestop Sealant
   3. Hilti CP 606 Flexible Firestop Sealant
   4. Hilti CP 604 Self-Leveling Firestop Sealant
   5. 3M Firestop Sealant 2000
   6. Tremco Tremstop Fyre-Sil Sealant

E. Intumescent sealants or caulking materials for use with combustible items (penetrants consumed by high heat and flame) including insulated metal pipe, PVC jacketed, flexible cable or cable bundles and plastic pipe, the following products are acceptable:
   1. Hilti FS-ONE Intumescent Firestop Sealant
   2. 3M Fire Barrier CP25 WB
   3. Tremco Tremstop WBM Intumescent Firestop Sealant

F. Intumescent sealants, caulking or putty materials for use with flexible cable or cable bundles, the following products are acceptable:
   1. Hilti FS-ONE Intumescent Firestop Sealant
   2. Hilti CP 618 Firestop Putty Stick
   3. 3M Fire Barrier CP25 WB
   4. Tremco Tremstop WBM Intumescent Firestop Sealant

G. Intumescent sealants, caulking or putty materials for use with flexible cable or cable bundles, the following products are acceptable:
   1. Hilti FS-ONE Intumescent Firestop Sealant
   2. Hilti CP 618 Firestop Putty Stick
   3. 3M Fire Barrier CP25 WB

4. Tremco Tremstop WBM Intumescent Firestop Sealant

H. Non curing, re-penetrable intumescent sealants, caulking or putty materials for use with flexible cable or cable bundles, the following products are acceptable:
   1. Hilti CP 618 Firestop Putty Stick

I. Non curing, re-penetrable intumescent sealants, caulking or putty materials for use with flexible cable or cable bundles, the following products are acceptable:
   1. Hilti CP 618 Firestop Putty Stick

J. Wall opening protective materials for use with UL listed metallic and specified nonmetallic outlet boxes, the following products are acceptable:
   1. Hilti CP 617 Firestop Putty Pad

K. Firestop collar or wrap devices attached to assembly around combustible plastic pipe (closed and open piping systems), the following products are acceptable:
   1. Hilti CP 642 Firestop Collar
   2. Hilti CP 643 Firestop Collar
   3. Hilti CP 645 Firestop Wrap Strip
   4. 3M Fire Barrier PPD Plastic Pipe Device

L. Cast-in place firestop devices for use with non-combustible and combustible plastic pipe (closed and open piping systems) penetrating concrete floors, the following products are acceptable:
   1. Hilti CP 680 Cast-In Place Firestop Device
   2. Hilti CP 681 Tub Box Kit for use with tub installations

M. Materials used for large size/complex penetrations made to accommodate multiple steel and cooper pipes, electrical busways in raceways, the following products are acceptable:
   1. Hilti FS 635 Trowelable Firestop Compound
   2. Hilti FS 657 FIRE BLOCK
   3. Hilti CP 620 Fire Foam
   4. 3M Firestop Foam 2001
   5. 3M Fire Barrier CS-195 Composite Sheet

N. Cables passing through fire-rated floors or walls shall pass through fire-rated wiring devices which contain an intumescent insert material that adjusts automatically to cable additions or subtractions.
   1. Hilti FS 657 FIRE BLOCK
   2. Specified Technologies Inc., EZ-PATH Fire Rated Pathway

O. Sealants or caulking materials used for openings between structurally separate sections of wall and floors, the following products are acceptable:
   1. Hilti CP 672 Firestop Spray
   2. Hilti CP 601s Elastomeric Firestop Sealant
   3. Hilti CP 606 Flexible Firestop Sealant
   4. Hilti CP 604 Self-Leveling Firestop Sealant
   5. 3M Fire Barrier CP 25 WB

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

C. Install backing materials to prevent liquid material from leakage.

3.03 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Do not cover installed firestopping until inspected by authorities having jurisdiction.

C. Install labeling required by code.

3.04 FIELD QUALITY CONTROL

A. A Special Inspection and Testing Agency (SITA) will perform field quality control tests and inspections, as specified in Sections 01 4516 and 01 4533.

B. Repair or replace penetration firestopping and joints at locations where inspection results indicate firestopping or joints do not meet specified requirements.

3.05 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.06 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 07 9200
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Self-leveling pourable joint sealants.

C. Joint backings and accessories.

1.02 RELATED REQUIREMENTS

A. Section 01 4000 – Quality Requirements

B. Section 03 3000 – Cast-In-Place Concrete

C. Section 04 2000 – Unit Masonry

D. Section 07 6200 – Sheet Metal Flashing and Trim

1.03 REFERENCE STANDARDS

A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2015 (Reapproved 2022).

B. ASTM C834 - Standard Specification for Latex Sealants; 2017.

C. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2022.

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

E. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

F. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2022.

G. ASTM C1311 - Standard Specification for Solvent Release Sealants; 2022.

H. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2018.

I. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints; 2019 (Reapproved 2020).

J. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).

K. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2015 (Reapproved 2021).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Submit manufacturer's technical datasheets for each product to be used; include the following:
   1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
   2. List of backing materials approved for use with the specific product.
   3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
   4. Substrates the product should not be used on.
   5. Substrates for which use of primer is required.

C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.

D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

E. Samples for Verification: Where custom sealant color is specified, obtain directions from Architect and submit at least two physical samples for verification of color of each required sealant.

F. Executed warranty.

G. Submit Material Safety Data Sheets under provisions of Section 01 7800 – Closeout Submittals for the following items:
   1. All mastics, glues, and adhesives
   2. Sealant (interior use only)

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten (10) years experience.

B. Installer Qualifications: Company specializing in performing the work of this section and with at least five (5) years of experience.

C. Field Adhesion Tests of Joints: Test for adhesion using most appropriate method in accordance with ASTM C1521, or another applicable method as recommended by manufacturer.
   1. All joint sealants shall be field tested for proper adhesion to the joint substrates prior to installation. Do not proceed with the work until job site tests have been approved by the Architect.
   2. Locate and provide test joints for each type of joint sealant, and substrate as directed by the Architect.
   3. Acceptable test joints will be used as the standard for all joint sealant work on the project.
      a. Sealants which fail to adhere to the substrates shall be removed and replaced at no extra cost to the Owner.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Installer’s Warranty: Correct defective work within a five (5) year period after Date of Substantial Completion.

C. Manufacturer Warranty:
   1. Silicone Exterior Joint Sealants: Twenty (20) years.
   2. Polyurethane Exterior Joint Sealants: Minimum five (5) years.
   3. All warranties shall include coverage for installed sealants and accessories that fail to achieve watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Nonsag Sealants:
   1. Dow Chemical Company: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
   2. Hilti, Inc: www.us.hilti.com/#sle.
   3. Master Builders Solutions: www.master-builders-solutions.com
   4. Momentive Performance Materials, Inc (formerly GE Silicones): www.momentive.com/#sle.
   5. Pecora Corporation: www.pecora.com/#sle.
   6. Sika Corporation: www.usa-sika.com/#sle.
   7. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
   8. Substitutions: See Section 01 6000 - Product Requirements.

B. Self-Leveling Sealants:
   1. Dow Chemical Company: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
   2. Master Builders Solutions: www.master-builders-solutions.com
   3. Pecora Corporation: www.pecora.com/#sle.
   4. Sika Corporation: www.usa-sika.com/#sle.
   5. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
   6. Substitutions: See Section 01 6000 - Product Requirements.

2.02 JOINT SEALANT APPLICATIONS

A. Scope:
   1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to:
      a. Wall expansion and control joints.
      b. Joints between door, window, and other frames and adjacent construction.
      c. Joints between different exposed materials.
      d. Openings below ledge angles in masonry.
      e. Other joints indicated below.
   2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
      a. Joints between door, window, and other frames and adjacent construction.
      b. In sound-rated wall and ceiling assemblies, gaps at electrical outlets, wiring devices, piping, and other openings; between wall/ceiling and other construction; and other flanking sound paths.
         1) Exception: Such gaps and openings in gypsum board and plaster finished stud walls and suspended ceilings.
         2) Exception: Through-penetrations in sound-rated assemblies that are also fire-rated.
      c. Other joints indicated below.
   3. Do not seal the following types of joints:
      a. Intentional weep holes in masonry.
      b. Joints indicated to be treated with manufactured expansion joint cover, or some other type of sealing device.
      c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
      d. Joints where installation of sealant is specified in another section.
      e. Joints between suspended panel ceilings/grid and walls.

B. Exterior Joint Sealant Schedule:
   1. Joint Type EJS-1: Vertical joints in exterior walls: Silicone, non-sag, non-staining sealant, minimum of Class 50, unless otherwise indicated.
   2. Joint Type EJS-2: Lap Joints in Sheet Metal Fabrications: Butyl rubber, non-curing.
   3. Joint Type EJS-3: Lap Joints between Manufactured Metal Panels: Butyl rubber, non-curing.
   4. Joint Type EJS-4: Control and Expansion Joints in Concrete Paving: Self-leveling polyurethane "traffic-grade" sealant.

C. Interior Joint Sealant Schedule: Use non-sag polyurethane sealant, unless otherwise indicated. Interior sealants shall be tamper resistant.
   1. Joint Type IJS-1: Wall and Ceiling Joints in Non-Wet Areas: Acrylic emulsion latex sealant.
   2. Joint Type IJS-2: Wall and Ceiling Joints in Wet Areas: Non-sag polyurethane sealant for continuous liquid immersion.

3. Joint Type IJS-3: Floor Joints in Wet Areas: Non-sag polyurethane " -traffic-grade" sealant suitable for continuous liquid immersion.
4. Joint Type IJS-4: Wall, Ceiling, and Floor Joints Where Tamper-Resistance is Required: Non-sag tamper-resistant polyurethane sealant.
5. Joint Type IJS-5: Joints between Fixtures in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; white.
6. Joint Type IJS-6: In Sound-Rated Assemblies: Acrylic emulsion latex sealant.
7. Joint Type IJS-7: Narrow Control Joints in Interior Concrete Slabs: Self-leveling polyurethane sealant.
8. Joint Type IJS-8: Other Floor Joints: Self-leveling polyurethane "traffic-grade" sealant.

D. Interior Wet Areas: Bathrooms, restrooms, kitchens, food service areas, and food processing areas; fixtures in wet areas include plumbing fixtures, food service equipment, countertops, cabinets, and other similar items.

E. Sound-Rated Assemblies: Walls and ceilings identified as STC-rated, sound-rated, or acoustical.

F. Areas Where Tamper-Resistance is Required: As indicated on drawings.

2.03 NONSAG JOINT SEALANTS

A. Type EJS-1 - Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 50 percent, minimum.
2. Nonstaining to Porous Stone: Nonstaining to light-colored natural stone when tested in accordance with ASTM C1248.
3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
4. Hardness Range: 15 to 35, Shore A, when tested in accordance with ASTM C661.
5. Color: Match adjacent finished surfaces.
6. Service Temperature Range: Minus 20 to 180 degrees F.

B. Type EJS-1 - Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 50 percent, minimum.
2. Hardness Range: 15 to 35, Shore A, when tested in accordance with ASTM C661.
3. Color: Match adjacent finished surfaces.
4. Service Temperature Range: Minus 65 to 180 degrees F.

C. Type IJS-5 - Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
1. Color: White.

D. Type IJS-2 - Polyurethane Sealant for Continuous Water Immersion: ASTM C920, Grade NS, Uses M and A; single or multi-component; explicitly approved by manufacturer for continuous water immersion; suitable for traffic exposure when recessed below traffic surface .
1. Movement Capability: Plus and minus 25 percent, minimum.
2. Hardness Range: 20 to 35, Shore A, when tested in accordance with ASTM C661.
3. Color: Match adjacent finished surfaces.
4. Service Temperature Range: Minus 40 to 180 degrees F.

E. Type IJS-3 - Non-Sag "Traffic-Grade" Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; explicitly approved by manufacturer for continuous water immersion and traffic without the necessity to recess sealant below traffic surface.
1. Movement Capability: Plus and minus 25 percent, minimum.
2. Hardness Range: 40 to 50, Shore A, when tested in accordance with ASTM C661.
3. Color: As scheduled.
4. Service Temperature Range: Minus 40 to 180 degrees F.

F. Type IJS-4 - Tamper-Resistant Polyurethane Sealant: ASTM C920, Grade NS, Uses M, G, and A; single or multi-component; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 12-1/2 percent, minimum.
   2. Hardness Range: 50 to 60, Shore A, when tested in accordance with ASTM C661.
   3. Color: Match adjacent finished surfaces.
   4. Service Temperature Range: Minus 40 to 180 degrees F.

G. Type IJS-1 - Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use.
   1. Color: Standard colors matching finished surfaces.
   2. Grade: ASTM C834; Grade 0 Degrees F (Minus 18 Degrees C).

H. Type EJS-2, EJS-3 - Non-Curing Butyl Sealant: Solvent-based, single component, non-sag, non-skinning, non-hardening, non-bleeding; non-vapor-permeable; intended for fully concealed applications.

2.04 SELF-LEVELING JOINT SEALANTS

A. Type IJS-7 - Self-Leveling Polyurethane Sealant: ASTM C920, Grade P, Uses M and A; single or multi-component; explicitly approved by manufacturer for traffic exposure; not expected to withstand continuous water immersion .
   1. Movement Capability: Plus and minus 25 percent, minimum.
   2. Hardness Range: 35 to 55, Shore A, when tested in accordance with ASTM C661.
   3. Color: Gray.
   4. Service Temperature Range: Minus 40 to 180 degrees F.

B. Type IJS-8 at horizontal expansion joint locations - Self-Leveling Polyurethane Sealant for Horizontal Expansion Joints: ASTM C920, Grade P, Uses T, M and O; multi-component; explicitly approved by manufacturer for horizontal expansion joints.
   1. Movement Capability: Plus and minus 25 percent, minimum.
   2. Hardness Range: 30 to 35, Shore A, when tested in accordance with ASTM C661.
   3. Color: Limestone.
   4. Tensile Strength: 200 to 250 psi in accordance with ASTM D412.

C. Type EJS-4, IJS-8 - Self-Leveling Polyurethane Sealant for Continuous Water Immersion: Polyurethane; ASTM C920, Grade P, Uses M and A; single or multi-component; explicitly approved by manufacturer for traffic exposure and continuous water immersion.
   1. Movement Capability: Plus and minus 25 percent, minimum.
   2. Hardness Range: 35 to 55, Shore A, when tested in accordance with ASTM C661.
   3. Color: Gray.
   4. Service Temperature Range: Minus 40 to 180 degrees F.

D. Type IJS-6 - High Quality Latex-Based Sound Sealant: ASTM C834, Type OP an opaque sealant, and Grade 0 Degrees C (32 Degrees F) meets requirements for low-temperature flexibility.
   1. Color: White.

E. Type EJS-4 locations as applicable - Semi-Self-Leveling Polyurethane Sealant: Intended for expansion joints in sidewalks, swimming pool decks, plazas, floors and other horizontal surfaces with up to 6 percent slope.
   1. Composition: Single or multicomponent.
   2. Durometer Hardness, Type A: 35 to 45, minimum, when tested in accordance with ASTM D2240.
   3. Color: Match adjacent finished surfaces.

2.05 ACCESSORIES

A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
   1. Horizontal: ASTM C1330; Type C - Closed Cell Polyethylene.
   2. Vertical: ASTM C1330; Type B - Bi-Cellular Polyethylene.
   3. Closed Cell and Bi-Cellular: 25 to 33 percent larger in diameter than joint width.

B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

C. Masking Tape: Self-adhesive, nonabsorbent, nonstaining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

D. Joint Cleaner: Noncorrosive and nonstaining type, type recommended by sealant manufacturer; compatible with joint forming materials.

E. Primers: Type recommended by sealant manufacturer to suit application; nonstaining.

F. Flexible Polyurethane Foam: Single-component, gun grade, and low-expanding.
   1. Color: White.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in an inconspicuous area to verify that it does not stain or discolor slab.

3.03 INSTALLATION

A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Provide joint sealant installations complying with ASTM C1193.

C. Install acoustical sealant application work in accordance with ASTM C919.

D. Measure joint dimensions and size joint backers to achieve the following, unless otherwise indicated:
   1. Width/depth ratio of 2:1.
   2. Neck dimension no greater than 1/3 of the joint width.
   3. Surface bond area on each side not less than 75 percent of joint width.

E. Install bond breaker backing tape where backer rod cannot be used.

F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

G. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

H. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

I. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

END OF SECTION

SECTION 07 9513
EXPANSION JOINT COVER ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Expansion joint cover assemblies for floor, wall, ceiling, and soffit surfaces.

1.02 RELATED REQUIREMENTS

A. Section 03 1000 - Concrete Forming and Accessories: Placement of joint cover assembly frames in formwork.

B. Section 04 2000 - Unit Masonry: Placement of joint cover assembly frames in masonry.

1.03 REFERENCE STANDARDS

A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

B. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

C. ASTM B308/B308M - Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles; 2020.

D. ITS (DIR) - Directory of Listed Products; current edition.

E. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Installation Templates: For frames and anchors to be embedded in concrete or masonry, furnish templates to relevant installers; include installation instructions and tolerances.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide joint assembly profiles, profile dimensions, anchorage devices and available colors and finish.

C. Shop Drawings: Indicate joint and splice locations, miters, layout of the work, effected adjacent construction and anchorage locations.

D. Samples: Submit two samples six inch long, illustrating profile, dimension, color, and finish selected of each specified product.

E. Manufacturer's Installation Instructions: Indicate rough-in sizes and required tolerances for item placement.

F. Submit Material Safety Data Sheets under provisions of Section 01 7800 – Closeout Submittals for the following items:
   1. All mastics, glues, and adhesives
   2. Thermal insulation (excluding fiberglass, foam, rubber)
   3. Fireproofing
   4. Sealant (interior use only)

G. Certificates - Material test reports from qualified independent testing laboratory indicating and interpreting test results relative to compliance of fire-rated expansion joint assemblies with requirements indicated.

1.06 QUALITY ASSURANCE

A. Materials and work shall conform to the latest edition of reference specifications specified here-in and to all applicable codes and requirements of local authorities having jurisdiction.

B. Fire Performance Characteristics - Where indicated, provide expansion joint cover assemblies identical to those of assemblies whose fire resistance has been determined per ANSI/UL 263, NFPA 251, U.B.C. 43-1, or rated period by Underwriters Laboratories, Inc.
   1. Fire Rating - Not less than the rating of adjacent construction.

C. Loading Characteristics - Standard floor covers should be designed to withstand a maximum point load of 500 lbs. without damage or permanent deformation. Heavy-duty covers should withstand a point load of 2,000 lbs.

D. Single-Source Responsibility - Obtain expansion joint cover assemblies from one source from a single manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Expansion Joint Cover Assemblies:
   1. Balco; a CSW Industrials Company: www.balcousa.com
   2. Construction Specialties, Inc: www.c-sgroup.com.
   3. EMSEAL Joint Systems, Ltd: www.emseal.com/#sle.
   4. Erie Metal Specialties, Inc.: www.eriemetal.com.
   5. Inpro: www.inprocorp.com/#sle.
   6. MM Systems Corp: www.mmsystemscorp.com.
   7. Nystrom, Inc: www.nystrom.com.
   8. Watson Bowman Acme Corp.: www.watsonbowmanacme.com.
   9. Substitutions: See Section 01 6000 - Product Requirements.

2.02 EXPANSION JOINT COVER ASSEMBLY APPLICATIONS

A. Floor Joints at all types of Floor Finish :
   1. C-S Group; Model GFT-100 X 2 Floor to Floor Transition
   2. C-S Group; Model GFTW-100 X 2 Floor to Wall Transition
   3. C-S Group; Model PC-100 Floor to Floor Plate Cover

B. Floor Joints at all types of Floor Finish at existing concrete floor slab locations:
   1. C-S Group; Model GFPS-100 Floor to Floor Transition
   2. C-S Group; Model GFPSW-100 Floor to Wall Transition

C. Wall Joints at all types of Walls, Surface Mounted:
   1. C-S Group; Model ASM-100 Flat
   2. C-S Group; Model ASMC-100 Corner Transition
   3. EMSEAL Joint Systems, Ltd; Interior Masonry.

D. Ceiling Joints at Suspended Acoustic Ceiling Finish:
   1. C-S group; Model HC-100 Flat
   2. C-S Group; Model HCW-100 Wall to Ceiling Transition

E. Ceiling Joints at Gypsum Board Ceiling Finish:
   1. C-S Group; Model FWF-100 Flat
   2. C-S Group; Model FWFC-100 Wall to Ceiling Transition

F. Interior/Exterior Fire-Rated Wall Joints Subject to Thermal Movement:
   1. Manufacturers:
      a. EMSEAL Joint Systems, Ltd; Emshield WFR2 System: www.emseal.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.03 EXPANSION JOINT COVER ASSEMBLIES

A. Expansion Joint Cover Assemblies - General: Factory-fabricated and assembled; designed to completely fill joint openings, sealed to prevent passage of air, dust, water, smoke; suitable for traffic expected.

1. Joint Dimensions and Configurations: As indicated on drawings.
2. Joint Cover Sizes: Selected to suit joint width and configuration, based on manufacturer's published recommendations and limitations.
3. Lengths: Provide covers in full lengths required; avoid splicing wherever possible.
4. Anchors, Fasteners, and Fittings: Provided by cover manufacturer.

B. Floor Joint Covers: Coordinate with indicated floor coverings.
1. If floor covering is not indicated, obtain instructions from Architect before proceeding.
2. If style is not indicated, provide extruded aluminum frame both sides, resilient seals, and minimize exposed metal.

C. Resilient Seal Type Covers: Having flat exposed surface without crevices that could collect dirt; designed to withstand expected movement without extrusion of seal from joint assembly; for floors, provide style that is flush with top of floor covering; for exterior joints, weathertight.

D. Sliding Cover Plate Type Covers: Provide plate with beveled edges and neat fit that does not collect dirt.

E. Covers In Gypsum Board Assemblies: Provide style with anchoring wings that can be completely covered by joint compound.

F. Covers In Fire Rated Assemblies: Provide cover assembly having fire rating equivalent to that of assembly into which it is installed.
1. Acceptable Evaluation Agencies: UL (DIR) and ITS (DIR).

2.04 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper; or ASTM B308/B308M, 6061 alloy, T6 temper.
1. Exposed Finish Outdoors: Natural anodized.
2. Exposed Finish at Floors: Mill finish or natural anodized.
3. Exposed Finish at Walls and Ceilings: Natural anodized.

B. Resilient Seals:
1. For Ceilings: Any resilient material, flush, pleated, or hollow gasket.
2. Color: Floor: Gray Ceilings: White.

C. All joints specified for 1" wide. Wider joints, if indicated on the drawings, shall be same model series.

D. Anchors and Fasteners: As recommended by cover manufacturer.

E. Ferrous Metal Anchors: Galvanized where embedded in concrete or in contact with cementitious materials.

F. Threaded Fasteners: Aluminum.

G. Backing Paint for Aluminum Components in Contact with Cementitious Materials: Asphaltic type.

H. Provide manufacturers associated fire barrier at fire rated walls and floors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine the area and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Verify that joint preparation and dimensions are acceptable and in accordance with manufacturer's requirements.

C. Verify that frames and anchors installed by others are in correct locations and suitable for installation of remainder of assembly.

3.02 PREPARATION

A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

3.03 INSTALLATION

A. Install components and accessories in accordance with manufacturer's instructions.

B. Align work plumb and level, flush with adjacent surfaces.

C. Rigidly anchor to substrate to prevent misalignment.

3.04 PROTECTION

A. Do not permit traffic over unprotected floor joint surfaces.

B. Provide strippable coating to protect finish surface.

END OF SECTION

SECTION 08 1113
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated hollow metal doors and frames.

B. Hollow metal frames for wood doors.

C. Fire-rated hollow metal doors and frames.

D. Thermally insulated hollow metal doors with frames.

E. Hollow metal borrowed lites glazing frames.

F. Accessories, including glazing, louvers, matching panels, and removable stops and astragals.

1.02 RELATED REQUIREMENTS

A. Section 08 7100 - Door Hardware.

B. Section 08 8000 - Glazing: Glass for doors and borrowed lites.

C. Section 09 9000 - Painting and Coating: Field painting.

1.03 REFERENCE STANDARDS

A. 2012 TAS - Texas Accessibility Standards; 2012.

B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2017.

D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2011.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2021.

G. 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; 2018a.

H. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames; 2016.

I. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

J. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.

K. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.

L. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2007.

M. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2014.

N. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2019.

O. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2013.

P. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

D. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

E. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

F. Submit Material Safety Data Sheets under provisions of Section 01 7800 – Closeout Submittals for the following items:
   1. All mastics, glues, and adhesives
   2. Thermal insulation (excluding fiberglass, foam, rubber)
   3. Sealant (interior use only)
   4. Fire doors (insulating material)

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

B. Maintain at project site copies of reference standards relating to installation of products specified.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hollow Metal Doors and Frames:
   1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com/#sle.
   2. Curries, an Assa Abloy Group company: www.assaabloydss.com/#sle.
   3. Deansteel Manufacturing, Inc.: www.deansteel.com.
   4. Fleming Door Products, an Assa Abloy Group company: www.assaabloydss.com/#sle.
   5. Mesker, dormakaba Group: www.meskeropeningsgroup.com/#sle.
   6. Pearland Industries, Inc.: www.pearlandindustries.com
   7. Republic Doors, an Allegion brand: www.republicdoor.com/#sle.
   8. Rocky Mountain Metals, Inc.: www.rockymountainmetals.com.
   9. Steelcraft, an Allegion brand: www.allegion.com/sle.
   10. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:
   1. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
   2. Accessibility: Comply with ICC A117.1, 2012 TAS and ADA Standards.
   3. Typical Door Face Sheets: Flush.

4. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
5. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
6. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.
    a. Based on NAAMM HMMA Custom Guidelines: Provide at least A25/ZF75 (galvannealed) for interior applications, and at least A60/ZF180 (galvannealed) or G60/Z180 (galvanized) for corrosive locations.

B. Hollow Metal Panels: Same construction, performance, and finish as doors.

C. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

D. Doors at interior locations shall be manufactured of cold rolled, or annealed steel. Doors must be of continuously welded, seamless construction with all angles, molds, returns and miters neatly welded and all weld beads ground smooth for finishing.

E. Doors at exterior locations shall be manufactured of A60 galvannealed or G60 hot dipped galvanized steel. Doors must be of continuously welded, seamless construction with all angles, molds, returns, and miters neatly welded and all weld beads ground smooth for finishing. All exterior doors shall seal tightly and not allow insect pests easy access to the buildings.

F. Face sheets of 16 gauge steel reinforced and sound-deadened by 22 gauge formed steel vertical stiffeners spaced not less than 6” o.c. and attached to face sheets by spot welds not less than 5” o.c. Vertical stiffeners at exterior door locations shall be galvannealed or hot dip galvanized. Voids between vertical stiffeners shall be filled with fiberglass batting.

G. Top and bottom edges closed with continuous recessed steel channels, of not less than 16 gauge, spot welded to both faces. Top edge of exterior doors sealed flush with welded in place closing channel to exclude water.

H. Overlapping steel astragals for pairs of labeled doors as required by manufacturer to meet codes.

I. Doors and frames are to be prepared to receive mortise type hardware and at hinge, lock, latch, and all other hardware locations, reinforcing plates shall be spot welded to the inner surface of the jambs. Hinge reinforcements shall not be less than 7 gauge steel. All top hinge reinforcements to incorporate manufacturer’s optional high frequency hinge reinforcement or full jamb depth hinge reinforcement. All other hardware reinforcements shall be not less than 12 gauge steel. Where door closers or brackets are to be installed, reinforcing plates shall be not less than 12 gauge steel. Twenty-four gauge galvanized steel plaster guards are to be spot welded over the hardware reinforcing plates. Provide 12 gauge reinforcement, for full height of door leaf, welded inside throat of frame to door rabbet wherever continuous geared hinges are scheduled. Provide 1/2” polystyrene, Celotex, or similar material, adhesive attached to the continuous hinge reinforcement inside the throat of the frame wherever continuous geared hinges are scheduled. Necessary holes for field installation of mortise type hardware shall be drilled and tapped from templates, which are to be furnished to the frame manufacturer by the hardware contractor. Provide suitable reinforcements for surface applied hardware, but no drilling or tapping is to be done at the factory for application of surface applied hardware. Prepare frames for silencers.

J. All glazing trim shall either be an integral part of the door face on the secure side with a removable bead flush with the opposite door face or metal glass light trim with a projection not to exceed 3/32” from either door face,

2.03 FULL AND TWO-LIGHT DOORS

A. Doors at interior locations shall be manufactured of cold rolled, or annealed steel. Doors must be of welded, seamless tubular stile and rail construction with all angles, tube intersections, molds, returns and miters neatly welded and all weld beads ground smooth for finishing. Visible seams on door faces are not acceptable.

B. Doors at exterior locations shall be manufactured of A60 galvannealed or G60 hot dipped galvanized steel. Doors must be of welded, seamless tubular stile and rail construction with all angles, tube intersections, molds, returns and miters neatly welded and all weld beads ground smooth for finishing. Visible seams on door faces are not acceptable.

C. Face sheets of 16 gauge steel. Voids in tubular members shall be filled with fiberglass batting.

D. Vertical stiles, top rail, and intermediate rail (if detailed) shall be of 6” nominal construction. Tubular construction of top rail shall provide a flush top surface to exclude water and moisture. Bottom rail shall be of 12” nominal construction.

2.04 HOLLOW METAL DOORS

A. Exterior Doors: Thermally insulated.
   1. Core Material: Manufacturers standard core material/construction and in compliance with requirements.
   2. Door Thermal Resistance: R-Value of 6 minimum.
   3. Door Thickness: 1-3/4 inch, nominal.
   4. Top Closures: Flush with top of faces and edges.
   5. Weatherstripping: Refer to Section 08 7100.

B. Interior Doors, Non-Fire Rated:
   1. Door Core Material: Vertical steel stiffeners.
   2. Door Thickness: 1-3/4 inch, nominal.

C. Fire-Rated Doors:
   1. Fire Rating: As indicated on drawings, tested in accordance with UL 10C ("positive pressure").
      a. Temperature-Rise Rating (TRR) Across Door Thickness: In accordance with local building code and authorities having jurisdiction.
      b. Provide units listed and labeled by UL (Underwriters Laboratories) - UL (BMD).
      c. Attach fire rating label to each fire rated unit.
   2. Core Material: Vertical steel stiffeners.
   3. Door Thickness: 1-3/4 inch, nominal.

2.05 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. Exterior Door Frames: Full profile/continuously welded type.
   1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
   2. Frame Metal Thickness: 14 gage, 0.067 inch, minimum.
   3. All angles, molds, returns and miters neatly welded and all weld beads ground smooth for finishing.
   4. Weatherstripping: Separate, see Section 08 7100.

C. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
   1. Frame Metal Thickness: 14 gage, 0.067 inch or 16 gage, 0.053 inch, minimum.

2. Three-sided frames for single doors up to and including 4’-0” in width shall be manufactured of 16 gauge steel. Frames for pairs of doors 6’-0” and over, all sidelight frames, and all borrowed light frames shall be manufactured of 14 gauge steel. All angles, molds, returns and miters neatly welded and all weld beads ground smooth for finishing.

D. Door Frames, Fire-Rated: Full profile/continuously welded type.
1. Fire Rating: Same as door, labeled.
2. Frame Metal Thickness: 14 gage, 0.067 inch or 16 gage, 0.053 inch, minimum.
3. Three-sided frames for single doors up to and including 4’-0” in width shall be manufactured of 16 gauge steel. Frames for pairs of doors 6’-0” and over, all sidelight frames, and all borrowed light frames shall be manufactured of 14 gauge steel. All angles, molds, returns and miters neatly welded and all weld beads ground smooth for finishing.

E. Mullions for Pairs of Doors: Fixed, except where removable is indicated, with profile similar to jambs.
1. All two-piece mullions shall be factory welded to form a single-piece, inseparable section before assembly into a frame unit.

F. Transom Bars: Fixed, of profile same as jamb and head.

2.06 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.07 ACCESSORIES

A. Louvers: Roll formed steel with concealed frame; finish same as door components ; factory-installed.
1. Style: Standard straight slat blade.
2. Fasteners: Exposed tamper proof fasteners.

B. Glazing: As specified in Section 08 8000.

C. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered corners; prepared for countersink style tamper proof screws.

D. Astragals for Double Doors: Specified in Section 08 7100.

E. Mechanical Fasteners for Concealed Metal-to-Metal Connections: Self-drilling, self-tapping, steel with electroplated zinc finish.

F. Grout for Frames: Portland cement grout with maximum 4 inch slump for hand troweling; thinner pumpable grout is prohibited.

G. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions. Omit silencers on exterior doors.

H. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

I. For each jamb in masonry construction, provide 3 or more 16 gauge adjustable jamb anchors of the T-anchor type or of the wire masonry anchor type spaced not more than 30” apart.

J. For each jamb in steel stud construction, provide 3 or more 18 gauge drywall type jamb anchors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

D. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

E. Verify exterior substrates and weather barriers have been completed to ensure proper air/water tight transition is maintained.

3.02 PREPARATION

A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.03 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

B. Install fire rated units in accordance with NFPA 80.

C. Where practicable, place frames prior to construction of enclosing walls and ceilings.

D. Set frames accurately into position, plumbed, aligned, and braced securely until permanent anchors are set.

E. Coordinate frame anchor placement with wall construction.

F. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

G. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.

H. At in-place construction, set frames and secure to adjacent construction with machine screws and suitable anchorage devices. Provide “Z” fillers at each screw location.

I. Fit and hang doors to maintain specified clearances. Metal hinge shims are acceptable to maintain clearances.

J. Install door hardware as specified in Section 08 7100.

K. Comply with glazing installation requirements of Section 08 8000.

L. Coordinate installation of electrical connections to electrical hardware items.

M. Immediately after erection, sand smooth all rusted and damaged areas of prime coat, and apply touch-up of compatible air-drying primer.

N. Touch up damaged factory finishes.

3.04 TOLERANCES

A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.

B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.05 ADJUSTING

A. Adjust for smooth and balanced door movement.

B. Adjust sound control doors so that seals are fully engaged when door is closed.

C. Test sound control doors for force to close, latch, and unlatch; adjust as necessary in compliance with requirements.

END OF SECTION

SECTION 08 1416
FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flush wood doors; flush and flush glazed configuration; fire-rated, non-rated, and acoustical.

B. High pressure decorative laminate facing

1.02 RELATED REQUIREMENTS

A. Section 01 6210 - Schedule of Materials and Colors

B. Section 08 1113 - Hollow Metal Doors and Frames.

C. Section 08 8000 - Glazing.

1.03 REFERENCE STANDARDS

A. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

B. ASTM E413 - Classification for Rating Sound Insulation; 2016.

C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

D. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. ITS (DIR) - Directory of Listed Products; current edition.

F. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

G. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2019.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

C. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.

D. Samples: Submit two samples of door veneer, 6 by 6 inches in size illustrating wood grain, stain color, and sheen.

E. Test Reports: Show compliance with specified requirements for the following:
   1. Sound-retardant doors and frames; sealed panel tests are not acceptable.

F. Samples: Submit three samples of door veneer, 6 by 6 inch in size illustrating plastic laminate pattern and color.

G. Manufacturer's Installation Instructions: Indicate special installation instructions.

H. Specimen warranty.

I. Warranty, executed in Owner's name.

J. Closeout Submittals
   1. Submit under provisions of Section 01 7800 – Closeout Submittals.
   2. Submit Material Safety Data Sheets under provisions of Section 01 7800 – Closeout Submittals for the following items:
      a. All mastics, glues, and adhesives
      b. Sealant (interior use only)
      c. Fire doors (insulating material)

1.05 QUALITY ASSURANCE

A. Maintain one copy of the specified door quality standard on site for review during installation and finishing.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than five years of documented experience.
   1. Company with at least one project within past five years with value of woodwork within at least 20 percent of cost of woodwork for this project.

C. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

D. Certifications
   1. Fire Ratings Compliance: Fire-rated wood doors to comply with NFPA-80, Positive Pressure Testing UBC 7-2-97 and/or UL10C, and requirements according to building code standards having local jurisdiction.
   2. Label Certification: All doors requiring fire-rating shall carry either UL or ITS (Warnock Hersey) metal label stating:
      a. Name and Logo of Listing Agency
      b. Name of Door Manufacturer
      c. Compliance with UBC 7-2-97 and/or UL10C
      d. Temperature rise rating
      e. Compliance with “S” label and/or UL 1784 requirements at all 20-minute rated doors and elsewhere as required by the building code and/or the AHJ
      f. Hourly rating

1.06 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver and store doors in accordance with specified quality standard.

B. Store doors flat and off the floor on a level surface in a dry, well-ventilated building. Do not store on edge. Protect doors from dirt, water and abuse.

C. Accept doors on site in manufacturer's packaging, and inspect for damage.

D. Protect doors with resilient packaging sealed with heat shrunk plastic; do not store in damp or wet areas or areas where sunlight might bleach veneer; seal top and bottom edges with tinted sealer if stored more than one week, and break seal on site to permit ventilation.

E. Do not subject interior doors to extremes in either heat or humidity. HVAC systems should be operational and balanced, providing a temperature range of 50 to 90 degrees Fahrenheit and 30% to 50% relative humidity.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, telegraphing core construction, and repair or replacement of the door as originally furnished.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. High Pressure Decorative Laminate (HPDL) Faced Doors:
   1. AJW Architectural Products: www.ajw.com/#sle.
   2. Oregon Door: www.oregondoor.com/#sle.
   3. Masonite Architectural: www.architectural.masonite.com/#sle.
   4. Poncraft Door Co: www.poncraft.com/#sle.
   5. VT Industries, Inc: www.vtindustries.com/#sle.
   6. Substitutions: See Section 01 6000 - Product Requirements.

2.02 DOORS AND PANELS

A. Doors: See drawings for locations and additional requirements.
   1. Quality Standard: Premium Grade, Heavy Duty performance, in accordance with AWI/AWMAC/WI (AWS), unless noted otherwise.
   2. High Pressure Decorative Laminate (HPDL) Faced Doors: 5-ply unless otherwise indicated.

B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
   1. Provide solid core doors at each location.
   2. Fire Rated Doors: Tested to ratings as indicated on drawings in accordance with ICC (IBC) - Positive Pressure; Underwriters Laboratories Inc. (UL) labeled.
   3. Sound Retardant Doors: Minimum STC of 45, calculated in accordance with ASTM E413, tested in accordance with ASTM E90.
   4. High pressure decorative laminate (HPDL) finish as indicated on drawings.

2.03 DOOR AND PANEL CORES

A. Non-Rated Solid Core and 20 Minute Rated Doors: Type structural composite lumber core (SCLC), plies and faces as indicated.

B. Fire-Rated Doors: Mineral core type, or fire resistant composite core (FD), plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting.

C. Sound-Rated Doors: Equivalent to type, with particleboard core (PC) construction as required to achieve STC rating specified; plies and faces as indicated above.

2.04 DOOR FACINGS

A. High Pressure Decorative Laminate (HPDL) Facing for Fire Doors: NEMA LD 3, SGF; color as selected; See Section 01 6210, Schedule of Materials and Colors.

B. High Pressure Decorative Laminate (HPDL) Facing for Non-Fire-Rated Doors: NEMA LD 3, HGS; color as selected; See Section 01 6210, Schedule of Materials and Colors.

C. Facing Adhesive: Type I - waterproof.

2.05 DOOR CONSTRUCTION

A. Fabricate doors in accordance with door quality standard specified.

B. Cores Constructed with stiles and rails:
   1. Provide solid blocks at Lock edge, top of door for closer, and exit devices for hardware reinforcement.
   2. Provide solid blocking for other throughbolted hardware.
   3. Mineral core veneer doors should have a minimum of 1/2” stile on hinge edge of door. Veneer shall be 5 ply.

C. Where supplementary protective edge trim is required, install trim after veneer facing has been applied full-width.

D. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

E. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.

F. Cut and configure exterior door edge to receive recessed weatherstripping devices.

G. Provide edge clearances in accordance with the quality standard specified.

2.06 ACCESSORIES

A. Hollow Metal Door Frames: See Section 08 1113.

B. Metal Louvers:

1. Material and Finish: Roll formed steel; pre-painted finish to color as selected.

C. Glazing: See Section 08 8000.

D. Glazing Stops: Wood with metal clips for rated doors, mitered corners; prepared for countersink style tamper proof screws.

E. Astragals for Fire-Rated Double Doors: Steel, T shaped, overlapping and recessed at face edge, specifically for double doors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standard.
1. Install fire-rated doors in accordance with NFPA 80 and ITS (DIR) requirements.

B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.

C. Use machine tools to cut or drill for hardware.

D. Coordinate installation of doors with installation of frames and hardware.

E. Coordinate installation of glazing.

F. Install door louvers plumb and level.

3.03 TOLERANCES

A. Comply with specified quality standard for fit and clearance tolerances.

B. Comply with specified quality standard for telegraphing, warp, and squareness.

3.04 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

END OF SECTION

SECTION 08 3100
ACCESS DOORS AND PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall and ceiling access door and frame units.

1.02 RELATED REQUIREMENTS

A. Section 09 9000 - Painting and Coating: Field paint finish.

1.03 REFERENCE STANDARDS

A. ITS (DIR) - Directory of Listed Products; current edition.

B. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

C. Shop Drawings: Indicate exact position of each access door and/or panel unit.

D. Manufacturer's Installation Instructions: Indicate installation requirements, rough-in dimensions, and operation features.

E. Project Record Documents: Record actual locations of each access unit.

F. Closeout Submittals
   1. Submit under provisions of Section 01 7800 – Closeout Submittals.
   2. Submit Material Safety Data Sheets under provisions of Section 01 7800 – Closeout Submittals for the following items:
      a. All mastics, glues and adhesives
      b. Sealant (interior use only)
      c. Fire doors (insulating material)

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years experience.

PART 2 PRODUCTS

2.01 ACCESS DOORS AND PANELS ASSEMBLIES

A. Wall-Mounted Units:
   1. Material: Steel.
   2. Size: 24 by 24 inch, unless otherwise indicated.
      a. 10 x 10 inches at single valve access and at all roof drain locations on first floor.
   3. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
   4. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.
   5. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.
   6. Plaster Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.
   7. Masonry Mounting Criteria: Provide surface-mounted frame with door surface flush with frame surface.

B. Wall-Mounted Units in Wet Areas:
   1. Material: Stainless steel.
   2. Size: 24 by 24 inch, unless otherwise indicated.
   3. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
   4. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.
   5. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.
   6. Plaster Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.
   7. Masonry Mounting Criteria: Provide surface-mounted frame with door surface flush with frame surface.

C. Fire-Rated Wall-Mounted Units:
   1. Wall Fire-Rating: As indicated on drawings.
   2. Material: Steel.
   3. Size: 24 by 24 inch, unless otherwise indicated.
   4. Door/Panel: Insulated double-surface panel, with tool-operated spring or cam lock and no handle.

D. Ceiling-Mounted Units:
   1. Material: Steel.
   2. Size in Other Ceilings: 24 by 24 inch, unless otherwise indicated.
   3. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

E. Fire-Rated Ceiling-Mounted Units:
   1. Ceiling Fire-Rating: As indicated on drawings.
   2. Material: Steel.
   3. Size: 24 by 24 inch, unless otherwise indicated.
   4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings are correctly sized and located.

B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to proceeding with this work.

B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.03 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install frames plumb and level in openings, and secure units rigidly in place.

C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION

SECTION 08 3313
OVERHEAD FOLDING DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Overhead Folding, Lifting and Bi-Fold doors

B. Motor Systems

1.02 RELATED SECTIONS

A. Section 08 7100 - Door Hardware: Cylinder locks.

B. Section 09 9000 - Paints and Coatings: Field painting.

1.03 REFERENCES

A. AS1170.2:2002 - Structural Design Actions - General Principles.

B. AS4100-1990- SAA Steel Structures Code.

C. AS 1288 - Glass in Buildings - Selection and Installation.

D. AA-6063-T6 - Standards for Aluminum Alloy and Temper.

E. ASTM A513, Type 1 – Steel Tubes.

F. ASTM A1008 – Sheet Steel for Covers.

G. ASTM A36 – Steel Bars.

H. ASTM A36 – Sheet Steel for Tracks/Channels.

1.04 PERFORMANCE REQUIREMENTS

A. Wind Loads: Design and size components to withstand loads caused by pressure and suction of wind acting normal to plane of wall as calculated in accordance with applicable code.

B. Single-Source Responsibility: Provide doors, tracks, motors, and accessories from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.

1.05 SUBMITTALS

A. Submit under provisions of Section 01 3000.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation manuals.

C. Shop Drawings: Indicate plans and elevations including opening dimensions and required tolerances, accessories and anchors, jamb details, connection details, anchorage spacing, hardware locations, and installation details.

D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, two samples, minimum size 3 inches (150 mm) square, representing actual product, color, and patterns.

F. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

G. Operation and Maintenance Data.

H. Submit written agreement in manufacturer’s standard form signed by manufacturer and installer agreeing to repair or replace defective doors that are warped, twisted, bowed or damaged as a result of defective product.

I. Any system that can not be operated manually is unacceptable.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum five years documented experience.

B. Installer Qualifications: Authorized representative of the manufacturer with minimum five years documented experience and/or be a factory trained and authorized installation company.

C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc. acceptable to authority having jurisdiction as suitable for purpose specified.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened labeled packaging until ready for installation.

B. Store materials in a clean, dry, ventilated, weathertight, secure location.

C. Protect materials from soiling, abuse, loss and moisture damage.

1.08 PROJECT CONDITIONS

A. Pre-Installation Conference: Convene a pre-installation conference just prior to commencement of field operations, to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

B. Environmental Conditions: Prior to and during installation, environmental conditions shall be in accordance with door manufacturers latest published recommendations for temperature, rain, wind, humidity, ventilation, and illumination.

C. Opening shall be free and clear of debris, stored materials, scaffolding, and temporary walls as necessary for installers to perform the installation.

1.09 WARRANTY

A. Manufacturer warrants to the original purchaser within two year from date of installation, if a product sold under this warranty proves to be defective in material or workmanship through normal use and service according to maintenance and operations instructions, as verified by inspection by persons authorized by Overhead Door Manufacturer. Manufacturer will be replace or repair the defective product.

B. Manufacturer warrants the steel frame against rust, in painted non-damaged condition for a period of two years from original purchase. This warranty does not apply to scratched, dented, damaged or corroded areas of the frame.

C. Motor System shall be warranted against manufacturing defects for a period of 2 years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. This Section is based on the products of Renlita Doors North America, LLC,: www.renlitadoors.com

B. Substitutions: See Section 01 6000 – Product Requirements

2.02 OVERHEAD DOORS

A. Two Leaf Hinged Stacking Overhead Doors: Two horizontal panels hinged together, weather lapped at horizontal joint; rising vertically on roller and track system fixed to building structure to stack in a folded position under lintel.
   1. Approved Product: S-3000, Foldaway Doors.
   2. Framework: Welded construction fabricated from rolled hollow section steel members with minimum wall thickness of 0.125 inch (3.1 mm). Beams shall be designed for maximum dead load deflection of 1/300th part of the span.
   3. Operating Channels fabricated from carbon steel hot rolled sheet to comply with ASTM A-36. Final finish on track in accordance with Part 2.4.

4. Counter Balancing: Counterweight system with enclosed counterweights suspended by 7/19 flexible multi-strand steel cables with minimum safety factor of 6:1. Cable shall be guided in steel sheaves with a minimum sheave to cable diameter ratio of 19:1. Sheaves shall be capable of carrying design loads.
5. Load is contained in the jambs and does not require a load bearing header or any additional lateral supports.
6. Mechanical pin lock fail-safe device that prevents door movement automatically in the event of a counterbalance or lifting device failure. Safety brake shall automatically reset once repairs are completed and be capable of repeated engagement without replacement of brake or components.
7. Construct steel door sections from carbon steel hot rolled tube complying with ASTM A-500 Grade B and ASTM A-36.
8. Counterweight Covers: Counterweights shall be protected and covered with a removable pressed sheet (aluminum or steel).
9. Doors shall have motorized operation unless otherwise noted. For manual operation, provide handle and safety device to be used to manually open/close the door and to be stored in operating channel when door is in open position acting as a safety device preventing accidental closure of the door. Door shall be equipped with keyed slide bar locking device located at lower panel adjacent to operating channel.
10. Escape and Access Doors: Outward opening doors with night latch.

B. Split Leaf Vertical Lifting Doors: Two panel steel frame, rising vertically on roller and track system fixed to building structure to rise behind header.
1. Approved Product: S-550, two panel Liftaway.
2. Framework: Welded construction fabricated from rolled hollow section steel members with minimum wall thickness of 0.125 inch (3.1 mm). Beams shall be designed for maximum dead load deflection of 1/300th part of the span.
3. Operating Channels fabricated from carbon steel hot rolled sheet to comply with ASTM A-36. Final finish on track in accordance with Part 2.4.
4. Counter Balancing: Counterweight system with enclosed counterweights suspended by 7/19 flexible multi-strand steel cables with minimum safety factor of 6:1. Cable shall be guided in steel sheaves with a minimum sheave to cable diameter ratio of 19:1. Sheaves shall be capable of carrying design loads.
5. Load is contained in the jambs and does not require a load bearing header or any additional lateral supports.
6. Mechanical pin lock fail-safe device that prevents door movement automatically in the event of a counterbalance or lifting device failure. Safety brake shall automatically reset once repairs are completed and be capable of repeated engagement without replacement of brake or components.
7. Construct steel door sections from carbon steel hot rolled tube complying with ASTM A-500 Grade B and ASTM A-36.
8. Counterweight Covers: Counterweights shall be protected and covered with a removable pressed sheet (aluminum or steel).
9. Doors shall have motorized operation unless otherwise noted. For manual operation, provide handle and safety device to be used to manually open/close the door and to be stored in operating channel when door is in open position acting as a safety device preventing accidental closure of the door. Door shall be equipped with keyed slide bar locking device located at lower panel adjacent to operating channel.

C. Bi-Fold Doors: Vertically gliding door with no floor tracks.
1. Approved Product: Sovereign Bi-Fold
2. Curtain: Constructed from 2-1/2 inch by 1-1/2 inch (65 mm by 40 mm) top and side rails and 1-1/4 inch by 1-1/2 inch (32 mm by 40 mm) mid rails.
3. Panels: Panels shall be secured by glazing bead, santoprene or PVC wedges.

a. Panel Heights: As indicated on Drawings.

4. Brackets and Tracks: Mono section configuration.
5. Side Guides: 5-1/2 inch by 2-3/8 inch (140 mm by 60 mm) extruded aluminum sections with twin 1/8 inch (3 mm) tracks.
6. Hardware/Hinges: Cast stainless steel constructed hinges with teflon inserts to ensure quiet and low friction operation.
7. Electrical Operation: Door shall be balanced by the use of torsion springs connected to a rotating shaft. The shaft ends are attached to cable drums which lift/lower the curtain via a flexible cable.
8. Locking:
   a. Centrally mounted, two way mortise key lock.

2.03 GLAZING AND PANELS

A. Glazing: Glazed in accordance with AS1288.
   1. See Section 08 8000 - Glazing

B. Panels:
   1. Provide panels as indicated. Reference drawings for details.

2.04 FINISHES

A. Finish, Ferrous Metals: All surfaces except working machine parts shall receive factory applied finish Powder coating, Abrasive clean to SSP-SP6.

B. Finish, Aluminum: Provide Clear anodized aluminum or powder coating as indicated on the door schedule.

C. Finish, Colors:
   1. As selected from manufacturer's full range of available colors. Refer to Schedule of Materials and Colors for details.

2.05 MOTOR SYSTEM

A. Basis of Design: Model: REDD (Renlita Electric Direct Drive), 1HP AC motor with 39:1 gear ration gearbox direct mounted to 1" door drive shaft. Motor is provided with control panel (mounted separately) and is controlled by a touch screen control station, photo eyes, and hardware necessary for installation
   1. Primary Speed Reduction: Worm gear-in-oil-bath reducer. Gear ratio is 39:1 with shaft speed of 34 RPM.
   2. Motor Travel: Motor up and down travel is set digitally in the control panel and door position is established by integrated shaft position encoder.
   3. Control Station: Touch screen control station provided as standard and is capable of being mounted into single gang electrical box (not provided by Renlita). Minimum dimensions of the electrical box are 3"x2"x2 1/2" and the box shall be square corner welded construction.
   4. Primary Entrapment Device: NEMA 4 Monitored Photo Sensors mounted maximum inches above the finished floor at each side of the door opening interior.
   5. Secondary Entrapment Device: REDD ALERT™ obstruction sensing technology. Door controls shall monitor the door operation for obstruction during the close cycle. If amperage increases above set limit, the motor shall stop and reverse direction. The sensitivity is set by a qualified installer during initial commissioning and shall be checked and adjusted annually.
   6. Temperature Rating: -15°F to 125°F
      a. 100% duty cycle. Unlimited number of operations per hour.
   7. Construction:
      a. Frame: 18.52" x 4.31" x 8.425"
      b. Frame Color: RAL 9005 Black
      c. Gearbox Oil Type: CLP VG680 Mineral Oil

d. Bearings: Sealed Bearings - pre lubricated from factory
e. Mounting: M4 - Vertical Orientation or M3 Horizontal Orientation.
f. Power Requirements: 110 volt AC, Single Phase, 6 amps.

8. Accessories:
   a. Universal Radio Receiver: Manufactured by Liftmaster™ model 850 LM.
   b. Capable of 310 Mhz, 315 Mhz, or 390 Mhz radio transmitters with Security + 2.0 Remotes
   c. Direct wires into Renlita REDD™ control panel. Power and controls are administered by REDD™ Control panel.
9. Quality Control:
   a. Factory Tests:
      1) Cycle each REDD™ motor head and gearbox before packaging to insure properoperation.
   b. Bench test each touch screen control panel prior to packaging for proper operation and configuration.

B. Doors shall be electronically operated with control system.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until openings have been properly prepared.

B. Verify wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.

C. Verify electric power is available and of correct characteristics.

D. If preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Inserts and Anchorages: Furnish inserts and anchoring devices suitable for the installation of the units and consistent with the manufacturer’s installation requirements. Coordinate delivery with other work to avoid delay.

B. Install overhead doors, operating equipment, hardware, seals, stops, anchors, inserts, supports and track in accordance with approved shop drawings and the manufacturer's printed instructions.

C. Coordinate installation with adjacent work to ensure proper clearances and allow for maintenance.

D. Anchor assembly to wall construction and building framing without distortion or stress.

E. Securely brace door tracks suspended from structure. Secure tracks to structural members only.

F. Fit and align door assembly including hardware.

G. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.

3.04 CLEANING AND ADJUSTING

A. Lubricate, test and adjust door assembly to smooth operation free from warp twist or distortion and in full contact with weather-stripping.

B. Clean doors, frames and glass.

C. Remove temporary labels and visible markings.

3.05 PROTECTION

A. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

B. Protect installed products until completion of project.

C. Touch-up, damaged coatings and finishes and repair minor damage before Substantial Completion.

3.06 MAINTENANCE

A. Post Installation Maintenance:
   1. Contractor and installer shall provide Owner with complete company name, address phone number, fax number and assigned contact for emergency repairs and scheduled maintenance for the installed door(s).

B. Training/Instruction for Owner for Operation and System Maintenance:
   1. Manufacturer shall instruct Owner's representative in regular tenant provided maintenance and operation of installed doors.

END OF SECTION

SECTION 08 3323
OVERHEAD COILING DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior insulated coiling doors.

B. Interior non-fire-rated coiling doors.

C. Fire-rated coiling doors.

D. Electric operators and control stations.

E. Wiring from electric circuit disconnect to operators and control stations.

1.02 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.

B. Division 26 - Electrical

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

C. ICC (IECC) - International Energy Conservation Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. ITS (DIR) - Directory of Listed Products; current edition.

E. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

F. NEMA MG 00001 - Motors and Generators; 2024.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2019.

I. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2019.

J. UL (DIR) - Online Certifications Directory; Current Edition.

K. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

L. UL 1784 - Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide general construction, electrical equipment, and component connections and details.

C. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.

D. Samples: Submit two slats, 3 by 6 inches in size illustrating shape, color and finish texture.

E. Manufacturer's Installation Instructions: Indicate installation sequence and procedures, adjustment and alignment procedures.

F. Manufacturer's qualification statement.

G. Installer's qualification statement.

H. Maintenance Data: Indicate lubrication requirements and frequency and periodic adjustments required.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years documented experience and approved by manufacturer.

C. Products Requiring Electrical Connection: Listed and classified by ITS (DIR), UL (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for purpose specified.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Submit a written warranty, executed by the Contractor, Installer, and Manufacturer, agreeing to repair or replace doors that fail in materials or workmanship within the specified warranty period.
   1. Warranty Period: One (1) year after date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Overhead Coiling Doors:
   1. C.H.I. Overhead Doors: www.chiohd.com/#sle.
   2. Clopay Building Products: www.clopaydoor.com/#sle.
   3. Cornell Iron Works, Inc: www.cornelliron.com/#sle.
   4. Raynor Garage Doors: www.raynor.com/#sle.
   5. The Cookson Company: www.cooksondoor.com/#sle.
   6. Wayne-Dalton, a Division of Overhead Door Corporation: www.wayne-dalton.com/#sle.
   7. Substitutions: See Section 01 6000 - Product Requirements.

2.02 COILING DOORS

A. Exterior Insulated Coiling Doors: Steel slat curtain.
   1. Capable of withstanding positive and negative design wind loads of 20 psf, without undue deflection or damage to components.
   2. Sandwich slat construction with insulated core of foamed-in-place polyurethane insulation; minimum R-value of 8.0.
   3. Air Infiltration – Maximum air leakage of 1.00 cfm/ft^2 in accordance with the ICC (IECC) International Energy Conservation Code.
   4. Nominal Slat Size: 3 inches wide by required length.
   5. Finish: Factory powder coated, color as selected. See Section 01 6210-Schedule of Materials and Colors.
   6. Guide, Angles: Powder coated to match curtain.
   7. Hood Enclosure: Manufacturer's standard; Powder coated to match curtain.
      a. Provide mechanism cover for all exposed moving operator components.
   8. Electric operation.
   9. Mounting: Surface mounted.

B. Interior Non-Fire-Rated Coiling Doors: Steel slat curtain.
   1. Single thickness slats.
   2. Nominal Slat Size: 2-1/2 inches wide by required length.
   3. Finish: Factory powder coated, color as selected. See Section 01 6210-Schedule of Materials and Colors.
   4. Guides, Angles: Powder coated to match curtain.
   5. Hood Enclosure: Manufacturer's standard; Powder coated to match curtain.

a. Provide mechanism cover for all exposed moving operator components.
6. Electric operation.
7. Mounting: Surface mounted.

C. Fire-Rated Coiling Doors: Steel slat curtain; comply with NFPA 80.
1. Provide fire rating as indicated on the drawings.
a. Provide smoke and draft control door assemblies tested in accordance with UL 1784.
2. Provide products listed and labeled by ITS (DIR) or UL (DIR) as suitable for purpose specified and indicated on drawings.
3. Single thickness slats.
4. Nominal Slat Size: 2-1/2 inches wide by required length.
5. Finish: Factory powder coated, color as selected. See Section 01 6210-Schedule of Materials and Colors.
6. Guides, Angles: Powder coated to match curtain.
7. Hood Enclosure: Manufacturer's standard; Powder coated to match curtain.
a. Provide mechanism cover for all exposed moving operator components.
8. Fire Alarm Release Mechanism: Electric-motor operated from fire alarm system.
a. Provide a failsafe motor operated door assembly requiring no ancillary or externally mounted release devices, cables, chains, pulleys, reset handles or mechanisms
b. Provide an internal electrical failsafe release device that requires no additional wiring, external cables or mounting locations.
c. Maintain automatic closure speed at not more than 9” per second.
d. Ensure that manual resetting of spring tension, release devices, linkages or mechanical dropouts will not be required.
e. Provide 10 second time delay for activation upon loss of power.
9. Electric operation.
10. Mounting: Surface mounted.

2.03 MATERIALS AND COMPONENTS

A. Metal Curtain Construction: Interlocking slats.
1. Slat Ends: Alternate slats fitted with end locks to act as wearing surface in guides and to prevent lateral movement.
2. Curtain Bottom for Slat Curtains: Fitted with angles or aluminum extrusions to provide reinforcement and positive contact in closed position.
3. Weatherstripping for Exterior Doors: Moisture and rot proof, resilient type, located at jamb edges, bottom of curtain, and lintel brush seal where curtain enters hood enclosure of exterior doors.
4. Smoke Seals: Provide brush or gasket type weatherstripping seals to prevent passage of smoke and hot gases in compliance with UL 1784 testing requirements.
5. Steel Slats: Minimum thickness, 22 gauge, 0.03 inch; ASTM A653/A653M galvanized steel sheet. Provide 20 gauge slats where opening size dictates.
a. Galvanizing: Minimum G60 coating.

B. Guides - Angle: ASTM A36/A36M metal angles, size as required for door configuration.

C. Hood Enclosure and Trim: Internally reinforced to maintain rigidity and shape.
1. Minimum thickness; 24 gauge, 0.024 inch.
2. Powder coated to match curtain.
3. Provide mechanism cover for all exposed moving operator components.

D. Lock Hardware:
1. For motor operated units, additional lock or latching mechanisms are not required.

E. Roller Shaft Counterbalance: Steel pipe and helical steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb nominal force to operate.

2.04 ELECTRIC OPERATION

A. Operator, Controls, Actuators, and Safeties: Comply with UL 325; provide products listed by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction.
   1. Provide tamperproof operation cycle counter.

B. Electric Operators:
   1. Mounting: Front of Coil.
   2. Motor Enclosure:
      a. Interior Coil: NEMA MG 00001, Type 1; totally enclosed fan cooled (TEFC).
   3. Motor Rating: Minimum 1/3 HP; industrial duty, or as required by the manufacturer.
   4. Motor Voltage: 120 volts, single phase, 60 Hz. minimum. Verify with electrical drawings.
   5. Controller Enclosure: NEMA EN 10250, Type 1.
   6. Opening Speed: 8-9 inches per second.
   7. Brake: Manufacturer's standard type, activated by motor controller.
   8. Manual override in case of power failure.
   9. See Division 26 - Electrical for electrical connections.

C. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated; enclose terminal lugs in terminal box sized to comply with NFPA 70.

D. Control Station: Provide standard “Open/Close” key-operated, 'Open-Close-Stop' momentary-contact control device with small format Best type 7-pin cylinder, NEMA 1B for each operator complying with UL 325.
   1. 24 volt circuit.
   2. Surface mounted, at interior door jamb at CMU walls.
   3. Recess mounted, at interior door jamb at gypsum walls.
   4. Entrapment Protection Devices: Provide sensing devices and safety mechanisms complying with UL 325.
      a. Primary Device: Provide monitored sensing edge with wireless edge connection to motor control circuit for momentary contact open/close control.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that opening sizes, tolerances and conditions are acceptable.

3.02 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install fire-rated doors in accordance with NFPA 80.

C. Install smoke door assemblies in accordance with NFPA 105.

D. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

E. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

F. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

G. Coordinate installation of electrical service with Division 26 Electrical.

H. Complete wiring from disconnect to unit components.

I. Complete wiring from fire alarm system.

J. Install enclosure and perimeter trim.

3.03 TOLERANCES

A. Maintain dimensional tolerances and alignment with adjacent work.

B. Maximum Variation From Plumb: 1/16 inch.

C. Maximum Variation From Level: 1/16 inch.

D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 feet straight edge.

3.04 ADJUSTING

A. Adjust operating assemblies for smooth and noiseless operation.

3.05 CLEANING

A. Clean installed components.

B. Remove labels and visible markings.

END OF SECTION

SECTION 08 3326
OVERHEAD COILING GRILLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Overhead coiling metal grilles and operating hardware; electrically operated.

B. Wiring from electric circuit disconnect to operator and to control station.

1.02 RELATED REQUIREMENTS

A. Section 08 7100 - Door Hardware: Cylinder cores and keys.

B. Division 26 - Electrical

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ITS (DIR) - Directory of Listed Products; current edition.

C. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

D. NEMA MG 00001 - Motors and Generators; 2024.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL (DIR) - Online Certifications Directory; Current Edition.

G. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide general construction component connections and details, and electrical equipment.

C. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.

D. Samples: Submit two grille members, 6 by 6 inch in size illustrating shape, color and finish texture.

E. Manufacturer's Installation Instructions: Indicate installation sequences and procedures, adjustment and alignment procedures.

F. Manufacturer's Qualification Statement.

G. Installer's Qualification Statement.

H. Maintenance Data: Indicate lubrication requirements and frequency and periodic adjustments required.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years documented experience and approved by manufacturer.

C. Products Requiring Electrical Connection: Listed and classified by ITS (DIR), UL (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for purpose specified.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Overhead Coiling Grilles:
   1. C.H.I. Overhead Doors: www.chiohd.com/#sle.
   2. Clopay Building Products: www.clopaydoor.com/#sle.
   3. Cornell Iron Works, Inc: www.cornelliron.com/#sle.
   4. The Cookson Company: www.cooksondoor.com/#sle.
   5. Raynor Garage Doors: www.raynor.com/#sle.
   6. Wayne-Dalton, a Division of Overhead Door Corporation: www.wayne-dalton.com/#sle.
   7. Substitutions: See Section 01 6000 - Product Requirements.

2.02 GRILLES AND COMPONENTS

A. Grille: Aluminum; horizontal bar curtain, coiling on overhead counterbalanced shaft.
   1. Finish: Anodized, Clear.
   2. Electric operation.
   3. Mounting: Surface mounted.

B. Curtain: Round horizontal bars connected with vertical links to form a brick pattern.
   1. Horizontal bars: 5/16 inch diameter.
   2. Bar spacing: 2 inch on center.
   3. Tube spacers: 1/2 inch diameter.
   4. Spacer spacing: 9 inch on center.
   5. Vertical links: Minimum 5/8 by 1/8 inch flat bar.
   6. Link spacing: 9 inch on center.
   7. Bar Ends: End links to be held in place by self-locking retaining rings.
   8. Bottom Bar: Extruded aluminum tubular section with sensing edge seal/cushion.
   9. Finish: Anodized, Clear.

C. Guides: Extruded aluminum section, of profile to retain grille in place with snap-on trim, polypropylene pile runners on both sides of curtain for quiet operation and wall mounting angles of same metal.
   1. Finish: Anodized, Clear.

D. Hood Enclosure and Trim (for exposed coil housing conditions): Sheet metal; completely covering operating mechanisms; internally reinforced to maintain rigidity and shape.
   1. Material: Aluminum.
   2. Sheet Metal Thickness: 0.040 inch.
   3. Finish: Anodized, Clear.

E. Lock Hardware:
   1. Center mounted on bottom bar, keyed locking with Best 7 pin cylinders with removable key core, operable from both sides of grille with lock bars into both jambs, with motor interlock cutout switches.

F. Roller Shaft Counterbalance: Steel pipe and helical steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb nominal force to operate.

2.03 MATERIALS

A. Aluminum: ASTM B221 (ASTM B221M).

B. Galvanized Steel Bars: Galvanized to minimum coating thickness grade in accordance with ASTM A123/A123M.

2.04 ELECTRIC OPERATION

A. Operator, Controls, Actuators, and Safeties: Comply with UL 325; provide products listed by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction.
   1. Provide tamperproof operation cycle counter.

B. Electric Operators:
   1. Mounting: Front of Coil.
   2. Motor Enclosure:
      a. Interior Coiling Grilles: NEMA MG 00001, Type 1; totally enclosed fan cooled (TEFC).
   3. Motor Rating: 1/3 hp; industrial duty, or as required by the manufacturer.
   4. Motor Voltage: 120 volts, single phase, 60 Hz. Verify with electrical drawings.
   5. Controller Enclosure: NEMA EN 10250 Type 1.
   6. Opening Speed: 8-9 inches per second.
   7. Brake: Manufacturer's standard type, activated by motor controller.
   8. Integral motor mounted interlock sensing to prevent damage to grille and operator when mechanical locking devices are engaged.
   9. Manual override in case of power failure.
   10. See Division 26 - Electrical for electrical connections.

C. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated; enclose terminal lugs in terminal box sized to comply with NFPA 70.

D. Control Station: Provide standard “Open/Close” key-operated "Open-Close-Stop" momentary-contact control device with small format Best type 7-pin cylinder, NEMA 1B for each operator complying with UL 325.
   1. 24 volt circuit.
   2. Surface mounted, at interior door jamb at CMU walls.
   3. Recess mounted, at interior door jamb at gypsum walls.
   4. Entrapment Protection Devices: Provide sensing devices and safety mechanisms complying with UL 325.
      a. Primary Device: Provide monitored sensing edge with wireless edge connection to motor control circuit for momentary contact open/close control.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that opening sizes, tolerances and conditions are acceptable.

3.02 INSTALLATION

A. Install grille unit assembly in accordance with manufacturer's instructions.

B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

E. Coordinate installation of electrical service with Division 26 Electrical.

F. Complete wiring from disconnect to unit components.

G. Install enclosure and perimeter trim.

3.03 TOLERANCES

A. Maintain dimensional tolerances and alignment with adjacent work.

B. Maximum Variation From Plumb: 1/16 inch.

C. Maximum Variation From Level: 1/16 inch.

D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 ft straight edge.

3.04 ADJUSTING

A. Adjust grille, hardware and operating assemblies for smooth and noiseless operation.

3.05 CLEANING

A. Clean grille and components.

B. Remove labels and visible markings.

END OF SECTION

SECTION 08 3473
SOUND CONTROL DOOR ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sound control door assemblies.
   1. Metal doors and frames.
   2. Wood doors and metal frames.
   3. Fire-rated doors and frames.
   4. Interior doors and frames, non-fire-rated.

B. Accessories, including glazing and matching panels.

1.02 RELATED REQUIREMENTS

A. Section 08 7100 - Door Hardware.

B. Section 08 8000 - Glazing: Glass for doors and borrowed lites.

1.03 ABBREVIATIONS AND ACRONYMS

A. ANSI: American National Standards Institute.

B. ASCE: American Society of Civil Engineers.

C. BHMA: Builders Hardware Manufacturers Association.

D. HMMA: Hollow Metal Manufacturers Association.

E. NAAMM: National Association of Architectural Metal Manufacturers.

F. NFPA: National Fire Protection Association.

G. SDI: Steel Door Institute.

H. UL: Underwriters Laboratories.

1.04 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ANSI/SDI A250.3 - Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames; 2007 (Reaffirmed 2011).

C. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2011.

D. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames; 2003 (R2009).

E. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2017.

F. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2011.

G. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

H. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2021.

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; 2018a.

J. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

K. ASTM E413 - Classification for Rating Sound Insulation; 2016.

L. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

M. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 4.0; 2021.

N. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames; 2016.

O. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

P. ITS (DIR) - Directory of Listed Products; current edition.

Q. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.

R. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.

S. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2007.

T. NAAMM HMMA 865 - Guide Specifications for Sound Control Hollow Metal Doors and Frames; 2013.

U. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2019.

V. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2017.

W. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2013.

X. SDI 128 - Guidelines for Acoustical Performance of Standard Steel Doors and Frames; 2016.

Y. UL (DIR) - Online Certifications Directory; Current Edition.

Z. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

AA. WDMA I.S. 1A - Interior Architectural Wood Flush Doors; 2013.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

D. Samples: Submit two samples of metal, showing factory finishes, colors, and surface texture.

E. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

F. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

G. Manufacturer's Qualification Statement.

H. Installer's Qualification Statement.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

C. Maintain at project site copies of reference standards relating to installation of products specified.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect metal doors in compliance with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) and specified requirements.
   1. Temporary Frame Spreaders: Provide welded frame jamb spreaders to bottom of metal frame prior to shipping.

B. Protect wood doors in compliance with WDMA I.S. 1A and specified requirements.

C. Remove doors and frames from resilient packaging upon delivery on site and inspect for damage, provide cover over doors for protection until installed, and store in vertical position properly braced with blocking to permit air circulation between components.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Sound Control Door Assemblies:
   1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com/#sle.
   2. Curries, an Assa Abloy Group company: www.assaabloydss.com/#sle.
   3. Industrial Acoustics Co, Inc (IAC): www.iac-acoustics.com
   4. Krieger Specialty Products: www.kriegerproducts.com
   5. Overly Door Company: www.overly.com/#sle.
   6. Substitutions: See Section 01 6000 - Product Requirements.

B. Wood Sound Control Door Assemblies:
   1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com/#sle.
   2. Curries, an Assa Abloy Group company: www.assaabloydss.com/#sle.
   3. Industrial Acoustics Co, Inc (IAC): www.iac-acoustics.com
   4. Krieger Specialty Products: www.kriegerproducts.com
   5. Overly Door Company: www.overly.com/#sle.
   6. Substitutions: See Section 01 6000 - Product Requirements.

2.02 REGULATORY REQUIREMENTS

A. Accessibility: Comply with ICC A117.1 and ADA Standards.

B. Opening Force of Sound Control Doors, Non-Fire Rated: 5 lbs, maximum, in compliance with ADA Standards.

C. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

D. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with specified requirements for each type; for instance, a sound control door is also indicated as being an exterior door must comply with requirements specified for sound control doors and exterior doors; where two requirements conflict, comply with most stringent.

2.03 COMPONENTS

A. Panels: Same construction, performance, and finish as doors.

B. Metal Door Top Closures: Flush end closure channel, with top and door faces aligned.

C. Door Edge Profile: Manufacturer's standard for application indicated.

D. Glazed Lights: Factory installed, with removable stops on secure side; sizes and configurations as indicated on drawings.
   1. Style: Manufacturer's standard.

2.04 SOUND CONTROL DOORS

A. Metal Sound Control Interior Doors: Provide fire-rated door construction as indicated.

1. Metal Doors: Refer to drawings for locations and additional requirements.
   a. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      1) Level 1 - Standard-duty.
      2) Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
      3) Model 1 - Full Flush.
      4) Comply with guidelines of SDI 128 for acoustic performance of metal doors and frames.
      5) Door Face Metal Thickness: 20 gauge, 0.032 inch, minimum.
   b. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
      1) Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.
         (a) Based on SDI Standards: Provide at least A40/ZF120 (galvannealed) where necessary, coating not required for typical interior door applications, and at least A60/ZF180 (galvannealed) for corrosive locations.
2. Sound Transmission Class (STC) Rating of Sound Control Door Assembly: STC of 50, minimum, tested in accordance with ASTM E413, and tested in accordance with ASTM E90.
3. Door Thickness: As required to comply with sound control requirements as indicated.
4. Door Face Sheets: Flush.
5. Door Finish: Factory primed and field finished.
6. Sound Seals: As required by manufacturer to meet indicated sound control ratings.
7. Interior Doors, Non-Fire Rated:
   a. Door Core Material: As required by manufacturer to meet indicated sound control ratings.
8. Fire-Rated Doors:
   a. Fire Rating: As indicated on drawings, complying with NFPA 80 and tested in accordance with UL 10C and NFPA 252 as positive pressure fire tests.
   b. Provide units listed and labeled by UL (DIR) or ITS (DIR).
      1) Attach fire rating label to each fire rated unit.
   c. Door Core Material: As required by manufacturer to meet indicated fire and sound control ratings.

B. Wood Sound Control Interior Doors: Provide fire-rated door construction as indicated.
1. Wood Doors: Refer to drawings for locations and additional requirements.
   a. Quality Standard: Custom Grade, Heavy Duty performance, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless otherwise indicated.
   b. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.
      1) Wood veneer facing with factory transparent finish as indicated on drawings.
   c. High Pressure Decorative Laminate (HPDL) Faced Doors: 5-ply unless otherwise indicated.
      1) High pressure decorative laminate (HPDL) finish as indicated on drawings.
2. Sound Transmission Class (STC) Rating of Sound Control Door Assembly: STC of 50, minimum, tested in accordance with ASTM E413, and tested in accordance with ASTM E90.
3. Door Thickness: As required to comply with sound control requirements as indicated.
4. Door Face Sheets: Flush.

5. Door Finish: Factory primed and field finished.
6. Sound Seals: As required by manufacturer to meet indicated sound control ratings.
7. Interior Doors, Non-Fire Rated:
   a. Door Core Material: As required by manufacturer to meet indicated sound control ratings.
8. Fire-Rated Doors:
   a. Fire Rating: As indicated on drawings, complying with NFPA 80 and tested in accordance with UL 10C and NFPA 252 as positive pressure fire tests.
   b. Provide units listed and labeled by UL (DIR) or ITS (DIR).
      1) Attach fire rating label to each fire rated unit.
   c. Door Core Material: As required by manufacturer to meet indicated fire and sound control ratings.

2.05 SOUND CONTROL DOOR FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. Metal Sound Control Interior Door Frames: Face welded type.
   1. Frame Finish: Factory primed and field finished.
   2. Interior Door Frames, Non-Fire Rated:
      a. Frame Metal Thickness: 14 gauge, 0.067 inch, minimum.
   3. Fire-Rated Door Frames:
      a. Fire Rating: Same as door, and labeled.
      b. Frame Metal Thickness: 14 gauge, 0.067 inch, minimum.

C. Mullions for Pairs of Doors: Removable type, with profile similar to jambs.

D. Transom Bars: Fixed, of profile same as jamb and head.

E. Provide mortar guard boxes for hardware cut-outs in frames installed in masonry or being grouted.

F. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inch high to fill opening without cutting masonry units.

G. Frames Wider than 48 inches: Reinforce with steel channel fitted tightly into frame head, flush with top.

2.06 DOOR HARDWARE

A. Astragals for Double Doors: Overlapping or meeting stile for field installation in compliance with sound control requirements.
   1. Fire-Rated Doors: Steel, and shape as required for fire rating.

B. Hinges: Cam lift type by door manufacturer, coordinate with Section 08 7100.

C. Threshold: Provide sound control/acoustic seal for sill of door in closed position by door manufacturer.

D. Sound Control Seals: Provide sound control/acoustic seals for jambs and head of door in closed position by door manufacturer.

2.07 FINISHES

A. Primer, Metal Doors and Frames: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard, in compliance with local VOC requirements.

B. Metal Door and Frame Finish: Complying with ANSI/SDI A250.3, manufacturer's standard coating.
   1. Color: As scheduled.

C. Wood Door Finish: Complying with WDMA I.S. 1A, premium grade, stain and clear coating.
   1. Color: As scheduled.

D. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

2.08 ACCESSORIES

A. Glazing: Laminated heat strengthened annealed glass, 1/2 inch (12.7 mm) overall thickness, factory installed, and tested to comply with specified sound control and fire ratings as indicated.

B. Mechanical Fasteners for Concealed Metal-to-Metal Connections: Self-drilling, self-tapping, steel with electroplated zinc finish.

C. Grout for Frames: Portland cement grout with maximum of 4 inch slump for hand troweling; thinner pumpable grout of higher slump is not permitted.
   1. Grouting of frames in drywall/gypsum board construction is not permitted.
   2. Frame to be packed with 10 pound density mineral wool.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 PREPARATION

A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.03 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

B. Install fire rated units in accordance with NFPA 80.

C. Coordinate frame anchor placement with wall construction.

D. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

E. Comply with recommended practice for hardware placement of doors and frames in accordance with ANSI/SDI A250.6 or NAAMM HMMA 865.

F. Factory installed glazing, comply with installation requirements; see Section 08 8000.

G. Coordinate installation of electrical connections to electrical hardware items.

H. Touch up damaged factory finishes.

3.04 TOLERANCES

A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 865.

B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.05 ADJUSTING

A. Adjust for smooth and balanced sound control door movement.

B. Adjust sound control doors so that seals are fully engaged when door is closed.

C. Adjust sound control doors for force to close, latch, and unlatch; adjust as necessary in compliance with requirements.

END OF SECTION

SECTION 08 3613
SECTIONAL DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Overhead sectional doors, electrically operated.

B. Electrical controls.

1.02 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

B. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

C. DASMA 102 - American National Standard Specifications for Sectional Overhead Type Doors; 2011.

D. ITS (DIR) - Directory of Listed Products; current edition.

E. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

F. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2000, with Errata (2008).

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL (DIR) - Online Certifications Directory; Current Edition.

I. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.

C. Product Data: Show component construction, anchorage method, and hardware.

D. Manufacturer's Installation Instructions: Include any special procedures required by project conditions.

E. Operation Data: Include normal operation, troubleshooting, and adjusting.

F. Maintenance Data: Include data for motor and transmission, shaft and gearing, lubrication frequency, spare part sources.

G. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least five years documented experience.

C. Comply with applicable code for motor and motor control requirements.

D. Products Requiring Electrical Connection: Listed and classified by ITS (DIR), UL (DIR), or testing firm acceptable to authorities having jurisdiction, as suitable for purpose specified.

1.05 WARRANTY

A. See Section 01 7800 - Closeout Submittals for warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Provide five year manufacturer warranty for electric operating equipment.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sectional Doors - Basis of Design: Raynor; AlumaView Model AV200: www.raynor.com.

B. Other Acceptable Manufacturers - Sectional Doors:
   1. C.H.I. Overhead Doors; Model 3295 Aluminum Full-View Doors: www.chiohd.com/#sle.
   2. Clopay Building Products; Model 930: www.clopaydoor.com/sle.
   3. Wayne-Dalton, a Division of Overhead Door Corporation; Model K-AL Series: www.wayne-dalton.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ALUMINUM DOORS

A. Aluminum Doors: Stile and rail aluminum with glazed panels; standard lift operating style with track and hardware; complying with DASMA 102, Commercial application.
   1. Door Nominal Thickness: 2 inches thick.
   2. Finish: Factory anodized; color as selected from manufacturers standard line.
   3. Glazed Lights: Full panel width, all rows; set in place with resilient glazing channel.
   4. Electric Operation: Electric control station.

B. Glazing: Fully tempered glass; insulated; clear; 1/2 inch thick.

2.03 COMPONENTS

A. Track: Galvanized steel angles, 0.094 inch minimum thickness; 2-5/16 x 4 inch size, continuous one piece per side; galvanized steel mounting brackets 1/4 inch thick.

B. Lock Cylinders: See Section .

2.04 MATERIALS

A. Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G60/Z180 coating, plain surface.

B. Aluminum Sheet: ASTM B209 (ASTM B209M), 5005 alloy, H14 temper, plain surface.

C. Aluminum Extrusions: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

D. Float Glass: Provide float glass glazing, unless noted otherwise.
   1. Heat-Strengthened and Fully Tempered Types: ASTM C1048.

2.05 ELECTRIC OPERATION

A. Electric Operators:
   1. Mounting: Side mounted on cross head shaft.
   2. Motor Enclosure:
   3. 1/2 hp; manually operable in case of power failure, transit speed of 12 inches per second.
   4. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.
   5. Controller Enclosure: NEMA EN 10250, Type 1.
   6. Opening Speed: 12 inches per second.
   7. Brake: Adjustable friction clutch type, activated by motor controller.
   8. Manual override in case of power failure.
   9. Refer to Section 26 0583 for electrical connections.

B. Motor: Comply with requirements of Section 22 0513.

C. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated; enclose terminal lugs in terminal box sized to comply with NFPA 70.

D. Control Station: Provide standard three button (Open-Close-Stop) momentary-contact control device for each operator complying with UL 325.
   1. 24 volt circuit.
   2. Surface mounted, at interior door jamb.
   3. Entrapment Protection Devices: Provide sensing devices and safety mechanisms complying with UL 325.
      a. Primary Device: Provide electric sensing edge, wireless sensing, NEMA 1 photo eye sensors, or NEMA 4X photo eye sensors as required with momentary-contact control device.

E. Safety Edge: Located at bottom of sectional door panel, full width; electro-mechanical sensitized type, wired to stop and reverse door direction upon striking object; hollow neoprene covered to provide weatherstrip seal.

F. Control Station: Standard three button (open-close-stop) momentary type control for each electric operator.
   1. Locate at location indicated unles otherwise directed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.

B. Verify that electric power is available and of the correct characteristics.

3.02 PREPARATION

A. Prepare opening to permit correct installation of door unit to perimeter air and vapor barrier seal.

B. Apply primer to wood frame.

3.03 INSTALLATION

A. Install door unit assembly in accordance with manufacturer's instructions.

B. Anchor assembly to wall construction and building framing without distortion or stress.

C. Securely brace door tracks suspended from structure. Secure tracks to structural members only.

D. Fit and align door assembly including hardware.

E. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.

3.04 TOLERANCES

A. Maximum Variation from Plumb: 1/16 inch.

B. Maximum Variation from Level: 1/16 inch.

C. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch from 10 ft straight edge.

D. Maintain dimensional tolerances and alignment with adjacent work.

3.05 ADJUSTING

A. Adjust door assembly for smooth operation and full contact with weatherstripping.

3.06 CLEANING

A. Clean doors and frames and glazing.

B. Remove temporary labels and visible markings.

3.07 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

B. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

END OF SECTION

SECTION 08 4313
ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed storefront, with vision glass.

B. Sun Shades

C. Aluminum doors and frames.

1.02 RELATED REQUIREMENTS

A. Section 08 7100 - Door Hardware: Hardware items other than specified in this section.

B. Section 08 8000 - Glazing: Glass and glazing accessories.

1.03 REFERENCE STANDARDS

A. AAMA 501 - North American Fenestration Standard/Specification for windows, doors, and skylights; Current Addition.

B. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems; 2015.

C. AAMA 502 - Voluntary Specification for Field Testing of Newly Installed Fenestration Products; 2012.

D. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).

A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; 2015.

B. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

E. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

F. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

G. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

H. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

I. 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).

J. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).

K. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2016).

L. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2015.

M. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

B. Preinstallation Meeting: Conduct a preinstallation meeting two weeks before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, internal drainage details.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.
   1. Include design engineer's stamp or seal on shop drawings for attachments and anchors.

D. Shop drawing sheets that include engineering information designed by the Contractor’s Delegated Design Engineer shall be signed and sealed in accordance with the Texas Engineering Practice Act. Sheets that do not provide information designed by the Contractor’s Engineer do not require being signed and sealed. Calculation packages require a signed and sealed cover sheet only. Any submittals requiring to be signed and sealed that are received without the signature and seal will be rejected without review.

E. Samples: Accompanying the Shop Drawings, submit:
   1. Sample of each exposed member.
   2. Samples of finish, showing complete range of color from darkest to lightest proposed for use on this Work.
   3. Samples, when approved by the Architect, will be used to verify that the installed finish is within the approved range.

F. Design Data: Provide framing member structural and physical characteristics, engineering calculations, and dimensional limitations stamped and signed by a Structural Engineer licensed in the State of Texas.

G. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.

H. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

I. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in Texas.

B. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.

C. Installer Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a two year period after Date of Substantial Completion.

C. Provide two year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

D. Provide two year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 BASIS OF DESIGN -- FRAMING FOR INSULATING GLAZING (EXTERIOR)

A. Center-Set Style, Thermally-Broken:
1. Basis of Design: Oldcastle BuildingEnvelope; Series 3000 Thermal MultiPlane.
2. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep.

B. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
1. Arcadia, Inc.: www.arcadiainc.com
2. Atlas Architectural Metals, Inc.: www.atlasarchmetals.com.
3. Columbia Commercial Building Products: ccbpwin.com.
4. C.R. Laurence Company, Inc; U.S. Aluminum: www.crl-arch.com/sle.
5. EFCO, a Pella Company: www.efcocorp.com/sle.
6. Kawneer Company, Inc.: www.kawneer.com.
7. Manko Window Systems, Inc.: www.mankowindows.com.
8. Oldcastle BuildingEnvelope: www.oldcastlebe.com.
9. Trulite Glass & Aluminum Solutions, LLC: www.trulite.com.
10. Tubelite, Inc.: www.tubeliteinc.com
11. YKK AP America Inc: www.ykkap.com.

C. Substitutions: See Section 01 6000 - Product Requirements.

2.02 BASIS OF DESIGN -- FRAMING FOR MONOLITHIC GLAZING (INTERIOR)

A. Center-Set Style:
1. Basis of Design: Oldcastle BuildingEnvelope; Series FG-3000.
2. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep.

B. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
1. Arcadia, Inc.: www.arcadiainc.com
2. Atlas Architectural Metals, Inc.: www.atlasarchmetals.com.
3. Columbia Commercial Building Products: ccbpwin.com.
4. C.R. Laurence Company, Inc; U.S. Aluminum: www.crl-arch.com/sle.
5. EFCO, a Pella Company: www.efcocorp.com/sle.
6. Kawneer Company, Inc.: www.kawneer.com.
7. Manko Window Systems, Inc.: www.mankowindows.com.
8. Oldcastle BuildingEnvelope: www.oldcastlebe.com.
9. Trulite Glass and Aluminum Solutions, LLC: www.trulite.com.
10. Tubelite, Inc.: www.tubeliteinc.com
11. YKK AP America Inc: www.ykkap.com.

C. Substitutions: See Section 01 6000 - Product Requirements.

2.03 BASIS OF DESIGN -- SWINGING DOORS

A. Wide Stile, Insulating Glazing, Not Thermally-Broken:
1. Basis of Design: Oldcastle BuildingEnvelop; WS-500 Standard Wide Stile Entrance Door
2. Thickness: 2 inches.

B. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
   1. Arcadia, Inc.: www.arcadiainc.com
   2. Atlas Architectural Metals, Inc.: www.atlasarchmetals.com.
   3. Columbia Commercial Building Products: ccbpwin.com.
   4. C.R. Laurence Company, Inc; U.S. Aluminum: www.crl-arch.com/sle.
   5. EFCO, a Pella Company: www.efcocorp.com/sle.
   6. Kawneer Company, Inc.: www.kawneer.com.
   7. Manko Window Systems, Inc.: www.mankowindows.com.
   8. Oldcastle BuildingEnvelope: www.oldcastlebe.com.
   9. Trulite Glass & Aluminum Solutions, LLC: www.trulite.com.
   10. Tubelite, Inc.: www.tubeliteinc.com
   11. YKK AP America Inc: www.ykkap.com.

C. Substitutions: See Section 01 6000 - Product Requirements.

2.04 STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
   1. Finish: Class I natural anodized.
      a. Factory finish all surfaces that will be exposed in completed assemblies.
   2. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
   3. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
   4. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
   5. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
   6. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
   7. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
   8. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glazing and inner sheet of infill panel and heel bead of glazing compound.
   9. Preparation for Window Treatments: Provide reinforced interior horizontal head rail.

B. Performance Requirements:
   1. General Requirements
      a. Drawings are diagrammatic and do not purport to identify nor solve problems of thermal or structural movement, glazing, anchorage or moisture disposal.
      b. Requirements shown by details are intended to establish basic dimension of units, sight lines and profiles of members.
      c. Provide concealed fastening.
      d. Provide entrance and storefront systems, including necessary modifications, to meet specified requirements and maintaining visual design concepts.

e. Attachment considerations are to take into account site peculiarities and expansion and contraction movements so there is no possibility of loosening, weakening or fracturing connection between units and building structure or between units themselves.
f. Anchors, fasteners and braces shall be structurally stressed not more than 50% of allowable stress when maximum loads are applied.
g. Provide for expansion and contraction without detriment to appearance or performance.
h. Assemblies shall be free from rattles, wind whistles and noise due to thermal and structural movement and wind pressure.
i. Not Permitted: Vibration harmonics, wind whistles, noises caused by thermal movement, thermal movement transmitted to other building elements, loosening, weakening, or fracturing of attachments or components of system.
j. Coordinate all door hardware with Section 08 7100 – Door Hardware.

2. Frame calculations shall be designed by a registered engineer in the State of Texas. Manufacturer is responsible for system reinforcing.
3. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
   a. Design Wind Loads: Comply with requirements of ASCE 7.
   b. Member Deflection: Limit member deflection to 1/175 in any direction, with full recovery of glazing materials.
4. Interior Storefront, shall have adequate strength and stiffness to resist a minimum horizontal load of 5psf.
   a. Member Deflection: Limit member deflection to 1/175 in any direction, with full recovery of glazing materials.
5. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on interior face, when tested in accordance with ASTM E331 at pressure differential of 8 psf.
6. Air Leakage Laboratory Test: Maximum of 0.06 cu ft/min sq ft of wall area, when tested in accordance with ASTM E283 at 6.27 psf pressure differential across assembly.
7. Thermal Requirements:
   a. Framing systems shall accommodate expansion and contraction movement due to surface temperature differentials of 180º F without causing buckling, stress on glass, failure of joint seals, excessive stress on structural elements, reduction of performance, or other detrimental effects.
   b. Ensure doors function normally within limits of specified temperature range.
   c. Thermal Break with a 1/4" separation consisting of a two part chemically curing, high density polyurethane which is mechanically and adhesively joined to aluminum storefront sections.

2.05 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, drainage holes and internal weep drainage system. All exterior locations, and where otherwise required, units must be thermally broken, with integral internal drainage systems.
   1. Framing members for interior applications need not be thermally broken.
   2. Glazing Stops: Flush.
   3. Structurally Reinforced Members: Extruded aluminum with internal reinforcement of structural steel member.

B. Aluminum Subframing and Sill Receptors: Extruded aluminum, thermally broken to match framing members, at all exterior locations and where otherwise required, integrate with framing member drainage system.
   1. Finish: Same as storefront.
   2. Subframing: At perimeter of units, where required.

3. Flat Fillers: Required at head and jamb exterior units wand where otherwise required.
4. Sill Receptors: At sills at exterior units.

C. Glazing: As specified in Section 08 8000.

D. Swing Doors: Glazed aluminum.
1. Thickness: 2 inches. with .188 inch wall thickness
2. Top Rail: 5 inches wide. Provide manufacturer's closure plate as required to accept door closure.
3. Vertical Stiles: 5 inches wide.
4. Mid Rail: 8 1/4 inches wide.
5. Bottom Rail: 10 inches wide.
6. Glazing Stops: Square.
7. Finish: Same as storefront.

E. Sun Shades: Shop fabricated, shop finished, extruded aluminum outriggers, louvers, and fascia, free of defects impairing strength, durability or appearance.
1. Configuration: As indicated on drawings.
2. Louver Type: Circular face with Slat blades.
3. Sun Shade Angle: Confirm blade orientation with Architect prior to ordering.
4. Outrigger Shape: Bullnose. Confirm configuration with Architect prior to ordering.
5. Design Criteria: Design and fabricate to resist the same loads as storefront system without failure, damage, or permanent deflection:
6. Sizes: As indicated on drawings.
7. Shop fabricate to the greatest extent possible; disassemble if necessary for shipping.

2.06 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Sheet Aluminum: ASTM B209 (ASTM B209M).

C. Structural Steel Sections: ASTM A36/A36M; galvanized in accordance with requirements of ASTM A123/A123M.

D. Internal Reinforcing:
1. ASTM A36 for carbon steel; or ASTM B308 for structural aluminum.
2. Shapes and sizes to suit installation.
3. Shop coat steel components after fabrication with alkyd type zinc chromate primer complying with FS TT-P-645.

E. Anchorage Devices:
1. Manufacturer's standard formed or fabricated steel or aluminum assemblies of shapes, plates, bars or tubes.

F. Fasteners:
1. Aluminum, non-magnetic stainless steel or other materials warranted by manufacturer to be non-corrosive and compatible with components being fastened.
2. Do not use exposed fasteners, except where unavoidable for application of hardware.
3. For exposed locations, provide countersunk Phillips head screws with finish matching items fastened.
4. For concealed locations, provide manufacturer's standard fasteners.
5. Provide nuts or washers of design having means to prevent disengagement; deforming of fastener threads is unacceptable.
6. Cap seal all fasteners with compatible sealant at exterior locations and where otherwise required.

G. Exposed Flashings: See drawing details and Sectoin 07 6200-Sheet Metal Flashing and Trim; finish to match framing members.

H. Glazing Reducer:
   1. 451-VG-029 Snap-in 1/4" infill adapter or equal by the frame manufacturer for storefront located at interior locations.

I. Glazing Gaskets:
   1. Compression type design, replaceable, molded or extruded, of neoprene, or ethylene propylene diene monomer (EPDM).
   2. Conform to ASTM C509 or C864.
   3. Profile and hardness as required to maintain uniform pressure for watertight seal.
   4. Provide in manufacturer's standard black color.

J. Weatherstripping:
   1. Wool pile conforming to AAMA 701.2; or extruded EPDM elastomeric conforming to ASTM C509 or C864.
   2. Provide EPDM or vinyl-blade gasket weatherstripping in bottom door rail, adjustable for contact with threshold.

K. "Anti-Walk" Edge Blocking: "W" shaped EPDM blocks for use in keeping glazing material stationary under vibration or seismic loading.

L. Baffles (at weep holes): Type as recommended by system manufacturer and shown in published installation instructions.

M. Glazing Accessories: As specified in Section 08 8000.

N. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.

2.07 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

B. Touch-Up Materials: As recommended by coating manufacturer for field application.

2.08 FABRICATION

A. Coordination of Fabrication:
   1. Check actual frame or door openings required in construction work by accurate field measurements before fabrication.
   2. Fabricate units to withstand loads which will be applied when system is in place.

B. General:
   1. Conceal fasteners wherever possible.
   2. Reinforce work as necessary for performance requirements and for support to structure.
   3. Comply with Section 08 8000 for glazing requirements.

C. Aluminum Framing:
   1. Provide members of size, shape and profile indicated, designed to provide for glazing from interior.
   2. Fabricate frame assemblies with joints straight and tight fitting.
   3. Maintain accurate relation of planes and angles, with hairline fit of contacting members.
   4. Seal horizontals and direct moisture accumulation to exterior.
   5. Provide flashings and other materials used internally or externally that are corrosive resistant, non-staining, non-bleeding and compatible with adjoining materials.
   6. Provide manufacturer's extrusions and accessories to accommodate expansion and contraction due to temperature changes without being detrimental to appearance or performance.
   7. Make provisions in framing for minimum edge clearance, nominal edge cover and nominal pocket width for thickness and type of glazing or infill used in accordance with recommendations of manufacturer.

8. Provide tight fitting, injection molded, plastic water deflectors at all intermediate horizontals.
9. Provide thermally broken aluminum backer plate at perimeter of all windows and individual sealed aluminum caps at the top of all vertical window frame mullions.
10. Provide fully soldered/sealed end dams at ends of sill receptor system. ABS end dams are not allowed.

D. Entrance Doors:
1. Fabricate with mechanical joints using internal reinforcing plates and shear blocks attached with fasteners and by welding.
2. Provide extruded aluminum glazing stops of square design, permanently anchored on security side and removable on opposite side.

E. Welding:
1. Comply with recommendations of the American Welding Society.
2. Use recommended electrodes and methods to avoid distortion and discoloration.
3. Grind exposed welds smooth and flush with adjacent surfaces; restore mechanical finish.

F. Flashings: Form from sheet aluminum with same finish as extruded sections. Apply finish after fabrication. Material thickness as required to suit condition without deflection or "oil-canning".

2.09 HARDWARE

A. Receive hardware supplied in accordance with Section 08 7100 – Door Hardware and install in accordance with requirements of this Section.

B. Cut, reinforce, drill and tap frames and doors as required to receive hardware.

C. Comply with hardware manufacturer's templates and instructions.

D. Use concealed fasteners wherever possible.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

3.02 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Verify exterior substrates and weather barriers have been completed to ensure proper air/water tight transition is maintained.

D. Provide alignment attachments and shims to permanently fasten system to building structure.

E. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

F. Provide thermal isolation where components penetrate or disrupt building insulation.

G. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

H. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.

I. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

J. Install operating sash.

K. Set thresholds in bed of sealant and secure.

L. Install hardware using templates provided.

M. Install glass and infill panels in accordance with Section 08 8000, using glazing method required to achieve performance criteria.

N. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inch per 3 feet non-cumulative or 0.06 inch per 10 feet, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general testing and inspection requirements.

B. Air/Water Leakage Testing: Provide testing per AAMA 502 at 10% of glazing area per building, to be performed at mockup, 35%, 50% and 90% completion.
   1. Testing to be performed at 0.67 times the ASTM E331 rated pressure provided by the manufacturer for the system, not less than 5.6 psf.

C. Water-Spray Test: Provide water spray quality test of installed storefront components in accordance with AAMA 501.2 during construction process and before installation of interior finishes.
   1. Perform a minimum of two tests in each designated area as indicated on drawings.
   2. Conduct tests in each area prior to 10% of glazing area per building, to be performed at mockup, 35%, 50% and 90% completion.

D. The Contractor is responsible for providing the Field Quality Control and testing as specified, unless otherwise noted. Testing must be performed by a qualified testing and inspection agency and must not self-performed. The Contractor is solely responsible for the cost, schedule, and associated rework if the building enclosure systems are not constructed in accordance with the Contract Documents or do not pass testing.

E. Failed tests are not accepted and require retesting until successful tests are achieved. The Contractor must implement repair(s) that are acceptable to the Architect and the Owner and retest the location to ensure the repair(s) is effective. If remedial repair(s) are not effective, the contractor must provide repairs and retest until the test results are satisfactory.

3.05 ADJUSTING

A. Test door operating functions. Adjust closing and latching speeds and other hardware in accordance with manufacturer's instructions to ensure smooth operation.

B. Adjust operating hardware for smooth operation.

3.06 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.

3.07 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 4413
GLAZED ALUMINUM CURTAIN WALLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed curtain wall, with vision glazing and glass infill panels.

1.02 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping: Firestop at system junction with structure.

B. Section 08 8000 - Glazing.

1.03 REFERENCE STANDARDS

A. AAMA 501 - North American Fenestration Standard/Specification for windows, doors, and skylights; Current Addition.

B. AAMA 501.1 - Standard Test Method for Water Penetration of Windows, Curtain Walls and Doors Using Dynamic Pressure; 2017.

C. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems; 2015.

D. AAMA 502 - Voluntary Specification for Field Testing of Newly Installed Fenestration Products; 2012.

E. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).

F. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.

A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; 2015.

B. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

F. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

G. ASTM C794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants; 2018 (Reapproved 2022).

H. 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).

I. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).

J. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2016).

K. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2015.

L. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, internal drainage details, glazing, and infill.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and field welding required.

D. Samples: Accompanying the Shop Drawings, submit:
   1. Sample of each exposed member.
   2. Samples of finish, showing complete range of color from darkest to lightest proposed for use on this Work.
   3. Samples, when approved by the Architect, will be used to verify that the installed finish is within the approved range.

E. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.

F. Design Data: Provide framing member structural and physical characteristics and engineering calculations, and identify dimensional limitations; include load calculations at points of attachment to building structure.

G. Shop drawing sheets that include engineering information designed by the Contractor’s Delegated Design Engineer shall be signed and sealed in accordance with the Texas Engineering Practice Act. Sheets that do not provide information designed by the Contractor’s Engineer do not require being signed and sealed. Calculation packages require a signed and sealed cover sheet only. Any submittals requiring to be signed and sealed that are received without the signature and seal will be rejected without review.

H. Test Reports: Submit results of full-size mock-up testing. Reports of tests previously performed on the same design are acceptable.

I. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

J. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Design curtain wall and its structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed at Texas.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with not less than five years of documented experience.

C. Installer Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.08 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.09 WARRANTY

A. See Section 01 7700 - Closeout Procedures, for additional warranty requirements.

B. Correct defective Work within a two year period after Date of Substantial Completion.

C. Provide two year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

D. Provide two year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 BASIS OF DESIGN

A. Pressure Cap Four Sides; Not Unitized, Field Assembled:
   1. Basis of Design: Kawneer Company Inc; 1600 Curtain Wall System.

B. Other Manufacturers: Provide either product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below.
   1. Arcadia, Inc.: www.arcadiainc.com
   2. Atlas Architectural Metals, Inc.: www.atlasarchmetals.com.
   3. Columbia Commercial Building Products: ccbpwin.com
   4. C.R. Laurence Company, Inc; U.S. Aluminum: www.crl-arch.com.
   5. EFCO, a Pella Company: www.efcocorp.com/sle.
   6. Kawneer Company, Inc.: www.kawneer.com
   7. Manko Window Systems, Inc.: www.mankowindows.com
   8. Oldcastle BuildingEnvelope: www.oldcastlebe.com.
   9. Trulite Glass & Aluminum Solutions, LLC: www.trulite.com.
   10. Tubelite, Inc.: www.tubeliteinc.com
   11. YKK AP America Inc: www.ykkap.com.

C. Substitutions: See Section 01 6000 - Product Requirements.

2.02 BASIS OF DESIGN - SWINGING DOORS

A. Wide Stile, Insulating Glazing, Not Thermally-Broken:
   1. Basis of Design: Kawneer Company Inc; 500 Heavy Wall Entrance Door.
   2. Thickness: 2 inches.

B. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
   1. Arcadia, Inc.: www.arcadiainc.com
   2. Atlas Architectural Metals, Inc.: www.atlasarchmetals.com.
   3. Columbia Commercial Building Products: ccbpwin.com
   4. C.R. Laurence Co., Inc; U.S. Aluminum: www.crl-arch.com.
   5. EFCO, a Pella Company: www.efcocorp.com.
   6. Kawneer Company, Inc.: www.kawneer.com
   7. Manko Window Systems, Inc.: www.mankowindows.com
   8. Oldcastle BuildingEnvelope: www.oldcastlebe.com.
   9. Trulite Glass & Aluminum Solutions, LLC: www.trulite.com.
   10. Tubelite, Inc.: www.tubeliteinc.com
   11. YKK AP America Inc.: www.ykkap.com.

C. Substitutions: See Section 01 6000 - Product Requirements.

2.03 CURTAIN WALL

A. Aluminum-Framed Curtain Wall: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
   1. Fabrication Method: Either shop/factory or field fabricated system.
   2. Glazing Method: Either shop/factory or field glazed system.
   3. Mullion Dimensions: 2-1/2 inches by depth as required by engineered drawings for structural performance.
   4. Finish: Class I natural anodized.
      a. Factory finish surfaces that will be exposed in completed assemblies.
      b. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
   5. Provide flush joints and corners, weathersealed, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for imposed loads.
   6. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
   7. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
   8. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
   9. Preparation for Window Treatments: Provide reinforced interior horizontal head rail.

B. Structural Performance Requirements: Design and size components to withstand the following load requirements without damage or permanent set.
   1. Design Wind Loads: Comply with the requirements of ASCE 7.
      a. Measure performance by testing in accordance with ASTM E330/E330M, using test loads equal to 1.5 times the design wind loads and 10 second duration of maximum pressure.
      b. Interior Curtain Walls shall have adequate strength and stiffness to resist a minimum horizontal load of 5psf.
      c. Member Deflection: For spans less than 13 feet 6 inches, limit member deflection to flexure limit of glass in any direction, and maximum of 1/175 of span or 3/4 inch, whichever is less and with full recovery of glazing materials.
      d. Member Deflection: For spans over 13 feet 6 inches and less than 40 feet, limit member deflection to flexure limit of glass in any direction, and maximum of 1/240 of span plus 1/4 inch, with full recovery of glazing materials.
   2. Movement: Accommodate the following movement without damage to components or deterioration of seals:
      a. Expansion and contraction caused by 180 degrees F surface temperature.
      b. Expansion and contraction caused by cycling temperature range of 170 degrees F over a 12 hour period.
      c. Movement of curtain wall relative to perimeter framing.
      d. Deflection of structural support framing, under permanent and dynamic loads.

C. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on indoor face when tested as follows:
   1. Test Pressure Differential: 12 psf.
   2. Test Method: AAMA 501.1.

D. Air Leakage: Maximum of 0.06 cu ft/min sq ft of wall area, when tested in accordance with ASTM E283 at 6.24 psf pressure differential across assembly.

E. Thermal Performance Requirements:
   1. Condensation Resistance Factor of Framing: 71, minimum, measured in accordance with AAMA 1503.
   2. Overall U-value Including Glazing: 0.46 Btu/(hr sq ft deg F), maximum.

2.04 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
   1. Framing members for interior applications need not be thermally broken.

B. Glazing: As specified in Section 08 8000.

2.05 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Structural Steel Sections: ASTM A36/A36M; galvanized in accordance with requirements of ASTM A123/A123M.

C. Fasteners:
   1. Aluminum, non-magnetic stainless steel or other materials warranted by manufacturer to be non-corrosive and compatible with components being fastened.
   2. Do not use exposed fasteners, except where unavoidable for application of hardware.
   3. For exposed locations, provide countersunk Phillips head screws with finish matching items fastened.
   4. For concealed locations, provide manufacturer's standard fasteners.
   5. Provide nuts or washers of design having means to prevent disengagement; deforming of fastener threads is unacceptable.
   6. Cap seal all fasteners with compatible sealant at exterior locations and where otherwise required.

D. Exposed Flashings: See drawing details and Sectoin 07 6200-Sheet Metal Flashing and Trim; finish to match framing members.

E. Firestopping: As specified in Section 07 8400.

F. Weatherseal Sealant: Silicone, with adhesion in compliance with ASTM C794; compatible with glazing accessories.

G. Sill Flashing Sealant: Elastomeric, silicone or polyurethane, and compatible with flashing material.

H. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

I. Glazing Accessories: As specified in Section 08 8000.

J. Shop and Touch-Up Primer for Steel Components: Zinc oxide, alkyd, linseed oil primer appropriate for use over hand cleaned steel.

K. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.

2.06 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

2.07 FABRICATION

A. Coordination of Fabrication:
   1. Check actual frame or door openings required in construction work by accurate field measurements before fabrication.
   2. Fabricate units to withstand loads which will be applied when system is in place.

B. General:

1. Conceal fasteners wherever possible.
2. Reinforce work as necessary for performance requirements and for support to structure.
3. Comply with Section 08 8000 for glazing requirements.

C. Aluminum Framing:
1. Provide members of size, shape and profile indicated, designed to provide for glazing from interior.
2. Fabricate frame assemblies with joints straight and tight fitting.
3. Maintain accurate relation of planes and angles, with hairline fit of contacting members.
4. Seal horizontals and direct moisture accumulation to exterior.
5. Provide flashings and other materials used internally or externally that are corrosive resistant, non-staining, non-bleeding and compatible with adjoining materials.
6. Provide manufacturer's extrusions and accessories to accommodate expansion and contraction due to temperature changes without being detrimental to appearance or performance.
7. Make provisions in framing for minimum edge clearance, nominal edge cover and nominal pocket width for thickness and type of glazing or infill used in accordance with recommendations of manufacturer.
8. Provide tight fitting, injection molded, plastic water deflectors at all intermediate horizontals.
9. Provide thermally broken aluminum backer plate at perimeter of all windows and individual aluminum caps at the top of all vertical window frame mullions.
10. Provide fully soldered end dams at ends of subsill system. ABS end dams are not allowed.

D. Entrance Doors:
1. Fabricate with mechanical joints using internal reinforcing plates and shear blocks attached with fasteners and by welding.
2. Provide extruded aluminum glazing stops of square design, permanently anchored on security side and removable on opposite side.

E. Welding:
1. Comply with recommendations of the American Welding Society.
2. Use recommended electrodes and methods to avoid distortion and discoloration.
3. Grind exposed welds smooth and flush with adjacent surfaces; restore mechanical finish.

F. Flashings: Form from sheet aluminum with same finish as extruded sections. Apply finish after fabrication. Material thickness as required to suit condition without deflection or "oil-canning".

2.08 HARDWARE

A. Receive hardware supplied in accordance with Section 08 7100 – Door Hardware and install in accordance with requirements of this Section.

B. Cut, reinforce, drill and tap frames and doors as required to receive hardware.

C. Comply with hardware manufacturer's templates and instructions.

D. Use concealed fasteners wherever possible.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other related work.

B. Verify that curtain wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

C. Verify that anchorage devices have been properly installed and located.

3.02 INSTALLATION

A. Install curtain wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Install firestopping at each floor slab edge.

H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

I. Pressure Plate Framing: Install glazing and infill panels in accordance with Section 08 8000, using glazing method required to achieve performance criteria.

J. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inches every 3 ft non-cumulative or 0.5 inches per 100 ft, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

C. Sealant Space Between Curtain Wall Mullions and Adjacent Construction: Maximum of 3/4 inch and minimum of 1/4 inch.

3.04 FIELD QUALITY CONTROL

A. Provide services of curtain wall manufacturer's field representative to observe for proper installation of system and submit report.

B. See Section 01 4000 - Quality Requirements, for general testing and inspection requirements.

C. Air/Water Leakage Testing: Provide chamber test per AAMA 502 at 10% of glazing area per building, to be performed at mockup, 35%, 50% and 90% completion.
   1. Testing to be performed at 0.67 times the ASTM E331 rated pressure provided by the manufacturer for the system, not less than 5.6 psf.

D. Water-Spray Test: Provide water spray quality test of installed curtain wall components in accordance with AAMA 501.2 during construction process and before installation of interior finishes.
   1. Perform a minimum of two tests in each designated area as indicated on drawings.

E. Conduct tests in each area prior to 10% of glazing area per building, to be performed at mockup, 35%, 50% and 90% completion.

F. The Contractor is responsible for providing the Field Quality Control and testing as specified, unless otherwise noted. Testing must be performed by a qualified testing and inspection agency and must not self-performed. The Contractor is solely responsible for the cost, schedule, and associated rework if the building enclosure systems are not constructed in accordance with the Contract Documents or do not pass testing.

G. Failed tests are not accepted and require retesting until successful tests are achieved. The Contractor must implement repair(s) that are acceptable to the Architect and the Owner and retest the location to ensure the repair(s) is effective. If remedial repair(s) are not effective, the contractor must provide repairs and retest until the test results are satisfactory.

3.05 ADJUSTING

A. Adjust operating sash for smooth operation.

3.06 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, take care to remove dirt from corners, and wipe surfaces clean.

3.07 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 4500
TRANSLUCENT WALL AND ROOF ASSEMBLIES

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes the translucent high impact sandwich panel system and accessories as shown and specified. Work includes providing and installing:
   1. 2 ¾ " factory prefabricated structural translucent sandwich panels
   2. Aluminum installation system

1.02 SUBMITTALS

A. Submit manufacturer's product data. Include construction details, material descriptions, profiles and finishes of canopy components.

B. Submit shop drawings. Include elevations and details.

C. Submit manufacturer's color charts showing the full range of colors available for factory-finished aluminum.
   1. When requested, submit samples for each exposed finish required, in same thickness and material indicated for the work and in size indicated below. If finishes involve normal color variations, include sample sets consisting of two or more units showing the full range of variations expected.
      a. Sandwich panels: 14" x 28" units
      b. Factory finished aluminum: 5" long sections

D. Submit Installer Certificate, signed by installer, certifying compliance with project qualification requirements.

E. Submit product reports from a qualified independent testing agency indicating each type and class of panel system complies with the project performance requirements, based on comprehensive testing of current products. Previously completed reports will be acceptable if for current manufacturer and indicative of products used on this project.
   1. Reports required are:
      a. International Building Code Evaluation Report
      b. Flame Spread and Smoke Developed (UL 723) - Submit UL Card
      c. Burn Extent (ASTM D 635)
      d. Color Difference (ASTM D 2244)
      e. Impact Strength (UL 972)
      f. Bond Tensile Strength (ASTM C 297 after aging by ASTM D 1037)
      g. Bond Shear Strength (ASTM D 1002)
      h. Beam Bending Strength (ASTM E 72)
      i. Fall Through Resistance (ASTM E 661)
      j. Insulation U-Factor (NFRC 100)
      k. Solar Heat Gain Coefficient (NFRC or Calculations)
      l. Fiberglass Panel Systems: Class A Roof Covering Burning Brand (ASTM E 108)
      m. Polycarbonate Panel Systems: Class C Roof Covering (ASTM E 108)

1.03 QUALITY ASSURANCE

A. Manufacturer's Qualifications
   1. Material and products shall be manufactured by a company continuously and regularly employed in the manufacture of specified materials for a period of at least ten consecutive years and which can show evidence of those materials being satisfactorily used on at least six projects of similar size, scope and location. At least three of the projects shall have been in successful use for ten years or longer.

2. Panel system must be listed by an ANSI accredited Evaluation Service, which requires quality control inspections and fire, structural and water infiltration testing of sandwich panel systems by an accredited agency.
3. Quality control inspections shall be conducted at least once each year and shall include manufacturing facilities, sandwich panel components and production sandwich panels for conformance with AC177 “Translucent Fiberglass Reinforced Plastic (FRP) Faced Panel Wall, Roof and Skylight Systems” as issued by the ICC-ES.

B. Installer’s Qualifications: Installation shall be by an experienced installer, which has been in the business of installing specified systems for at least two consecutive years and can show evidence of satisfactory completion of projects of similar size, scope and type.

1.04 PERFORMANCE REQUIREMENTS

A. The manufacturer shall be responsible for the configuration and fabrication of the complete canopy panel system.
1. When requested, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Structural Loads; Provide system capable of handling loads as indicated on the structural drawings.

1.05 DELIVERY STORAGE AND HANDLING

A. Deliver panel system, components and materials in manufacturer's standard protective packaging.

B. Store panels on the long edge; several inches above the ground, blocked and under cover in accordance with manufacturer's storage and handling instructions.

1.06 WARRANTY

A. Submit manufacturer's and installer's written warranty agreeing to repair or replace panel system work, which fails in materials or workmanship within one year of the date of delivery. Failure of materials or workmanship shall include excessive deflection; deterioration of finish on metal in excess of normal weathering; and defects in accessories, translucent sandwich panels, and other components of the work.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Kalwall: www.kalwall.com.

B. Kingspan Light + Air / CPI Daylighting: www.cpidaylighting.com

C. Major Industries, Inc: www.majorskylights.com.

D. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PANEL COMPONENTS

A. High Impact Face Sheets
1. Translucent faces (Exterior and Interior): Manufactured from glass fiber reinforced thermoset resins or extruded cellular polycarbonate sheets, formulated specifically for architectural use.
a. Interior face sheets:
1) Flame spread: Underwriters Laboratories (UL) listed, which requires periodic unannounced retesting, with flame spread rating no greater than 25 when tested in accordance with UL 723.
2) Burn extent by ASTM D 635 shall be no greater than 1”.
b. Exterior face sheets:

1) Color stability: Full thickness of the face sheets shall not change color more than 3 CIE Units DELTA E by ASTM D 2244 after 3 years outdoor South Florida weathering at 5° facing south, determined by the average of at least three white samples with and without a protective film or coating to ensure long-term color stability. Color stability shall be unaffected by abrasion or scratching.
2) Strength: Exterior face sheet shall be uniform in strength, impenetrable by hand held pencil and repel an impact minimum of 70 ft. lbs. without fracture or tear when impacted by a 3-1/4" diameter, 5 lb. free-falling ball per UL 972.

c. Appearance:
1) Fiberglass panels:
(a) Exterior face sheets: Smooth, 0.070" thick and "Super Weathering White" in color,
(b) Interior face sheets: Smooth, 0.045" and "white" in color,.
2) Cellular Polycarbonate panels:
(a) Exterior face sheets: Smooth, 0.393" thick and "white ice" in color,
(b) Interior face sheets: Smooth, 0.314" and "white matte" in color,.
3) Face sheets shall not vary more than ± 10% in thickness and be uniform in color.

B. Grid Core
1. Aluminum I-beam grid core shall be of 6063-T6 or 6005-T5 alloy and temper with provisions for mechanical interlocking of muntin-mullion and perimeter. Width of I-beam shall be no less than 7/16".

C. Laminate Adhesive
1. Heat and pressure resin type adhesive engineered for structural sandwich panel use, with minimum 25-years field use. Adhesive shall pass testing requirements specified by the International Code Council "Acceptance Criteria for Sandwich Panel Adhesives".
2. Minimum tensile strength of 750 PSI when the panel assembly is tested by ASTM C 297 after two exposures to six cycles each of the aging conditions prescribed by ASTM D 1037.
3. Minimum shear strength of the panel adhesive by ASTM D 1002 after exposure to four separate conditions:
a. 50% Relative Humidity at 68° F: 540 PSI
b. 182° F: 100 PSI
c. Accelerated Aging by ASTM D 1037 at room temperature: 800 PSI
d. Accelerated Aging by ASTM D 1037 at 182° F: 250 PSI

2.03 PANEL CONSTRUCTION

A. Provide non-thermally broken sandwich panels of flat fiberglass reinforced translucent face sheets laminated to a grid core of mechanically interlocking I-beams. The adhesive bonding line shall be straight, cover the entire width of the I-beam and have a neat, sharp edge.
1. Thickness: 2-3/4"
2. Light transmission: 16%
3. Panel U-factor: .29
4. Grid pattern: Nominal size: 12x 24; Pattern "Shoji"

B. Standard panels shall deflect no more than 1.9" at 30 PSF in 10' 0" span without a supporting frame by ASTM E 72.

C. Standard panels shall withstand 1200° F fire for minimum one hour without collapse or exterior flaming.

D. See drawings for configuration and details.

E. Canopy/Skylight/Skyroof Systems:

1. System shall meet the fall through requirements of OSHA 1910.23 as demonstrated by testing in accordance with ASTM E661, thereby not requiring supplemental screens or railings.

2.04 BATTENS AND PERIMETER CLOSURE SYSTEM

A. Closure system:
   1. Extruded aluminum 6063-T6 and 6063-T5 alloy and temper clamp-tite screw type closure system.

B. Sealing tape: Manufacturer's standard, pre-applied to closure system at the factory under controlled conditions.

C. Fasteners: 300 series stainless steel screws for aluminum closures, excluding final fasteners to the building.

D. Finish:
   1. Manufacturer's factory applied finish, which meets the performance requirements of AAMA 2604. Color to be selected from manufacturer's standards.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Installer shall examine substrates, supporting structure and installation conditions.

B. Do not proceed with panel installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Metal Protection:
   1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
   2. Where aluminum will contact concrete, masonry or pressure treated wood, protect against corrosion by painting contact surfaces with bituminous paint or method recommended by manufacturer.

3.03 INSTALLATION

A. Install the system in accordance with the manufacturer's suggested installation recommendations and approved shop drawings.
   1. Anchor component parts securely in place by permanent mechanical attachment system.
   2. Accommodate thermal and mechanical movements.
   3. Set perimeter framing in a full bed of sealant compound, or with joint fillers or gaskets to provide weather-tight construction.

B. Install joint sealants at perimeter joints and within the panel system in accordance with manufacturer's installation instructions.

3.04 CLEANING

A. Clean the canopy system interior and exterior, immediately after installation.

B. Refer to manufacturer's written recommendations.

END OF SECTION 10 73 00

SECTION 08 5659
SERVICE AND TELLER WINDOW UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Service and teller sliding window units.

1.02 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

D. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

E. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate work with adjacent materials specified in other sections and as indicated on drawings and approved shop drawings.

B. Preinstallation Meeting: Prior to start of installation arrange a meeting on site to familiarize installer and installers of related work with requirements relating to this work.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Submit manufacturer's product data for specified products indicating materials, operation, glazing, finishes, and installation instructions.

C. Shop Drawings: Indicate configuration, sizes, rough-in, mounting, anchors and fasteners, and installation clearances.

D. Samples for Selection of Finishes: (when color anodized is specified)
   1. Applied Finishes: Color charts for factory finishes.
   2. Color Anodized Finishes: Frame member sections showing range of color to be expected in finished work.

E. Manufacturer Qualification Statement.

F. Installer Qualification Statement.

G. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with at least five years documented experience, and with ability to provide test reports showing that their standard manufactured products meet the specified requirements.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver units in manufacturer's original packaging and unopened containers with identification labels intact.

B. Store units in area protected from exposure to weather and vandalism.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Provide manufacturer's warranty agreeing to repair or replace units and their components that fail in materials or workmanship within one year from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Service and Teller Window Units:
   1. C. R. Laurence Co., Inc.: www.crlaurence.com
   2. Quikserv: www.quikserv.com/#sle.
   3. Ready Access, Inc: www.ready-access.com/#sle.

2.02 SERVICE AND TELLER SLIDING WINDOW UNITS

A. Location: Built within interior wall, as indicated on drawings.

B. Type of Use: Walk-up.

C. Window Type: Sliding, single horizontal.
   1. Operation: Manual, self-closing.
   2. Mounting: Flush with the wall surface.
   3. Window Size: As indicated on drawings.
   4. Material: Aluminum.
      a. Finish: Color anodized, dark bronze.

D. Glazing: Single (monolithic), clear.
   1. Tempered safety glazing.

E. Products:
   1. Basis of Design: C. R. Laurence Co.; Model D1038 Sliding Glass Windows: www.crlaurence.com
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.03 ASSEMBLY COMPONENTS

A. Windows: Factory-fabricated, finished, and glazed, with extruded aluminum frame and glazing stops; complete with hardware and anchors.
   1. Provide window units that are re-glazable from the secure side without dismantling the non-secure side of framing.
   2. Rigidly fit and secure joints and corners with internal reinforcement. Make joints and connections flush, hairline, and weatherproof. Fully weld corners.
   3. Apply factory finish to exposed surfaces.
   4. Apply bituminous paint to concealed metal surfaces in contact with cementitious or dissimilar materials.
   5. Self-Closing Operation: Manual open and self-closing with auto-locking handles and magnetic hold-open device.

2.04 MATERIALS

A. Aluminum Extrusions: Minimum 1/8 inch thick frame and sash material complying with ASTM B221 and ASTM B221M.
   1. Finish: Class I natural anodized.

B. Stainless Steel: Type 304 with No. 3 - Coarse finish.

C. Concealed Steel Items: Galvanized in accordance with ASTM A123/A123M to thickness Grade 85, 2.0 ounces per square foot.
   1. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20 zinc rich.

D. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

2.05 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

2.06 ACCESSORIES

A. Hardware and Security Devices for Sliding Windows:
   1. Locks: Jamb mounted keyed locks.
   2. Handles: Manufacturer's standard profile and finish.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that window openings are ready for installation of windows.

B. Verify that correct embedded anchors are in place and in proper location; repair or replace anchors as required to achieve satisfactory installation.

C. Notify Architect if conditions are not suitable for installation of units; do not proceed until conditions are satisfactory.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install units in correct orientation (inside/outside or secure/non-secure).

C. Anchor units securely in manner so as to achieve performance specified.

D. Set sill members and sill flashing in continuous bead of sealant.

E. Separate metal members from concrete and masonry using bituminous paint or with products recommended in writing by the manufacturer for this purpose.

F. Remove and replace defective work.

3.03 ADJUSTING

A. Adjust operating components for smooth operation while also maintaining a secure, weather-tight enclosure and a tight fit at the contact points; lubricate operating hardware.

3.04 CLEANING

A. Remove protective material from factory finished surfaces.

B. Clean exposed surfaces promptly after installation without damaging finishes.

3.05 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain operable units.
   1. Instructor: Manufacturer's training personnel.
   2. Location: At project site.
   3. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

3.06 PROTECTION

A. Provide temporary protection to ensure that service and teller windows are without damage upon Date of Substantial Completion.

END OF SECTION

SECTION 08 7100
DOOR HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Mechanical and electrified door hardware
2. Electronic access control system components

B. Section excludes:

1. Windows
2. Cabinets (casework), including locks in cabinets
3. Signage
4. Toilet accessories
5. Overhead doors

C. Related Sections:

1. Division 01 Section "Alternates" for alternates affecting this section.
2. Division 06 Section "Rough Carpentry"
3. Division 06 Section "Finish Carpentry"
4. Division 07 Section "Joint Sealants" for sealant requirements applicable to threshold installation specified in this section.
5. Division 08 Sections:
   a. "Metal Doors and Frames"
   b. "Flush Wood Doors"
   c. "Stile and Rail Wood Doors"
   d. "Interior Aluminum Doors and Frames"
   e. "Aluminum-Framed Entrances and Storefronts"
   f. "Stainless Steel Doors and Frames"
   g. "Special Function Doors"
   h. "Entrances"
6. Division 26 "Electrical" sections for connections to electrical power system and for low-voltage wiring.
7. Division 28 "Electronic Safety and Security" sections for coordination with other components of electronic access control system and fire alarm system.

1.02 REFERENCES

A. UL LLC

1. UL 10B - Fire Test of Door Assemblies
2. UL 10C - Positive Pressure Test of Fire Door Assemblies
3. UL 1784 - Air Leakage Tests of Door Assemblies
4. UL 305 - Panic Hardware

B. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule
2. Recommended Locations for Builders Hardware
3. Keying Systems and Nomenclature
4. Installation Guide for Doors and Hardware

C. NFPA – National Fire Protection Association

1. NFPA 70 – National Electric Code
2. NFPA 80 – 2016 Edition – Standard for Fire Doors and Other Opening Protectives
3. NFPA 101 – Life Safety Code
4. NFPA 105 – Smoke and Draft Control Door Assemblies
5. NFPA 252 – Fire Tests of Door Assemblies

D. ANSI - American National Standards Institute

1. ANSI A117.1 – 2017 Edition – Accessible and Usable Buildings and Facilities
2. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
3. ANSI/BHMA A156.28 - Recommended Practices for Keying Systems
4. ANSI/WDMA I.S. 1A - Interior Architectural Wood Flush Doors
5. ANSI/SDI A250.8 - Standard Steel Doors and Frames

1.03 SUBMITTALS

A. General:

1. Submit in accordance with Conditions of Contract and Division 01 Submittal Procedures.
2. Prior to forwarding submittal:
   a. Review drawings and Sections from related trades to verify compatibility with specified hardware.
   b. Highlight, encircle, or otherwise specifically identify on submittals: deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.

B. Action Submittals:

1. Product Data: Submit technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:
   a. Wiring Diagrams: For power, signal, and control wiring and including:
      1) Details of interface of electrified door hardware and building safety and security systems.
      2) Schematic diagram of systems that interface with electrified door hardware.
      3) Point-to-point wiring.
      4) Risers.

3. Samples for Verification: If requested by Architect, submit production sample of requested door hardware unit in finish indicated and tagged with full description for coordination with schedule.

   a. Samples will be returned to supplier. Units that are acceptable to Architect may, after

final check of operations, be incorporated into Work, within limitations of key coordination requirements.

4. Door Hardware Schedule:
   a. Submit concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work critical in Project construction schedule.
   b. Submit under direct supervision of a Door Hardware Institute (DHI) certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule published by DHI.
   c. Indicate complete designations of each item required for each opening, include:
      1) Door Index: door number, heading number, and Architect's hardware set number.
      2) Quantity, type, style, function, size, and finish of each hardware item.
      3) Name and manufacturer of each item.
      4) Fastenings and other pertinent information.
      5) Location of each hardware set cross-referenced to indications on Drawings.
      6) Explanation of all abbreviations, symbols, and codes contained in schedule.
      7) Mounting locations for hardware.
      8) Door and frame sizes and materials.
      9) Degree of door swing and handing.
      10) Operational Description of openings with electrified hardware covering egress, ingress (access), and fire/smoke alarm connections.

5. Key Schedule:
   a. After Keying Conference, provide keying schedule that includes levels of keying, explanations of key system's function, key symbols used, and door numbers controlled.
   b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
   c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
   d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
   e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion. Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
   f. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.

C. Informational Submittals:

1. Provide Qualification Data for Supplier, Installer and Architectural Hardware Consultant.
2. Provide Product Data:
   a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
   b. Include warranties for specified door hardware.

D. Closeout Submittals:

1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:
   a. Complete information on care, maintenance, and adjustment; data on repair and

replacement parts, and information on preservation of finishes.
b. Catalog pages for each product.
c. Final approved hardware schedule edited to reflect conditions as installed.
d. Final keying schedule
e. Copy of warranties including appropriate reference numbers for manufacturers to identify project.
f. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.

E. Inspection and Testing:

1. Submit written reports to the Owner and Authority Having Jurisdiction (AHJ) of the results of functional testing and inspection for:
   a. Fire door assemblies, in compliance with NFPA 80.
   b. Required egress door assemblies, in compliance with NFPA 101.

1.04 QUALITY ASSURANCE

A. Qualifications and Responsibilities:

1. Supplier: Recognized architectural hardware supplier with a minimum of 5 years documented experience supplying both mechanical and electromechanical door hardware similar in quantity, type, and quality to that indicated for this Project. Supplier to be recognized as a factory direct distributor by the manufacturer of the primary materials with a warehousing facility in the Project's vicinity. Supplier to have on staff, a certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.
2. Installer: Qualified tradesperson skilled in the application of commercial grade hardware with experience installing door hardware similar in quantity, type, and quality as indicated for this Project.
3. Architectural Hardware Consultant: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:
   a. For door hardware: DHI certified AHC or DHC.
   b. Can provide installation and technical data to Architect and other related subcontractors.
   c. Can inspect and verify components are in working order upon completion of installation.
   d. Capable of producing wiring diagram and coordinating installation of electrified hardware with Architect and electrical engineers.

4. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

B. Certifications:

1. Fire-Rated Door Openings:
   a. Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction.

   b. Provide only items of door hardware that are listed products tested by UL LLC, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on

testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.

2. Smoke and Draft Control Door Assemblies:
   a. Provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105
   b. Comply with the maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.

3. Electrified Door Hardware
   a. Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.

4. Accessibility Requirements:
   a. Comply with governing accessibility regulations cited in "REFERENCES" article 087100, 1.02.D3 herein for door hardware on doors in an accessible route. This project must comply with all Federal Americans with Disability Act regulations and all Local Accessibility Regulations.

C. Pre-Installation Meetings

1. Keying Conference
   a. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
      1) Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
      2) Preliminary key system schematic diagram.
      3) Requirements for key control system.
      4) Requirements for access control.
      5) Address for delivery of keys.

2. Pre-installation Conference
   a. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   b. Inspect and discuss preparatory work performed by other trades.
   c. Inspect and discuss electrical roughing-in for electrified door hardware.
   d. Review sequence of operation for each type of electrified door hardware.
   e. Review required testing, inspecting, and certifying procedures.
   f. Review questions or concerns related to proper installation and adjustment of door hardware.

3. Electrified Hardware Coordination Conference:
   a. Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping.

B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package. Deliver each article of hardware in manufacturer's original packaging.

C. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.

D. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

E. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.

F. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

1.06 COORDINATION

A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.

B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

1.07 WARRANTY

A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within published warranty period.

1. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.
2. Warranty Period: Beginning from date of Substantial Completion, for durations indicated in manufacturer's published listings.
    a. Mechanical Warranty
        1) Extra Heavy Duty Cylindrical Locks: 10 years
        2) Exit Devices: 3 years
        3) Closers: 30 years
    b. Electrical Warranty: 1 year

1.08 MAINTENANCE

A. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

B. Turn over unused materials to Owner for maintenance purposes.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Approval of alternate manufacturers and/or products other than those listed as "Scheduled Manufacturer" or "Acceptable Manufacturers" in the individual article for the product category are only to be considered by official substitution request in accordance with section 01 25 00.

B. Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.

C. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

D. The below listed manufactures are considered acceptable provided written authorization from Tomball ISD has been secured and is presented with submittal for validation.

ITEM:	MANUFACTURER:	ACCEPTABLE SUB:
Hinges	(IVE) Ives	Hager, McKinney
Key System	(SCH) Schlage	No Substitution
Locks	(SCH) Schlage	No Substitution
Exit Devices	(VON) Von Duprin	No Substitution
Closers	(LCN) LCN	No Substitution
Auto Flush Bolts	(IVE) Ives	DCI, Rockwood
Coordinators	(IVE) Ives	Hager, Rockwood
Silencers	(IVE) Ives	Hager, Rockwood
Push & Pull Plates	(IVE) Ives	Hager, Rockwood
Vandal Resistant Trim	(IVE) Ives	Owner’s Standard
Kickplates	(IVE) Ives	Hager, Rockwood
Stops & Holders	(IVE) Ives	Hager, Rockwood
Overhead Stops	(GLY) Glynn-Johnson	ABH
Thresholds	(ZER) Zero Int.	NGP, Pemko
Seals & Bottoms	(ZER) Zero Int.	NGP, Pemko
Key Cabinets	(LUN) Lund	TelKee

2.02 MATERIALS

A. Fabrication

1. Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. provide screws according to manufacturer’s recognized installation standards for application intended.
2. Finish exposed screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.

3. Provide concealed fasteners wherever possible for hardware units exposed when door is closed. Coordinate with “Metal Doors and Frames”, “Flush Wood Doors”, “Stile and Rail Wood Doors” to ensure proper reinforcements. Advise the Architect where visible fasteners, such as thru bolts, are required.

B. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.

1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

C. Cable and Connectors:

1. Where scheduled in the hardware sets, provide each item of electrified hardware and wire harnesses with number and gage of wires enough to accommodate electric function of specified hardware.
2. Provide Molex connectors that plug directly into connectors from harnesses, electric locking and power transfer devices.
3. Provide through-door wire harness for each electrified locking device installed in a door and wire harness for each electrified hinge, electrified continuous hinge, electrified pivot, and electric power transfer for connection to power supplies.

2.03 HINGES

A. Requirements:

1. Provide hinges conforming to ANSI/BHMA A156.1.
2. Provide five knuckle, ball bearing hinges.
3. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:
   a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
   b. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high

4. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:
   a. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high
   b. Interior: Heavy weight, steel, 5 inches (127 mm) high

5. 2 inches or thicker doors:
   a. Exterior: Heavy weight, bronze or stainless steel, 5 inches (127 mm) high
   b. Interior: Heavy weight, steel, 5 inches (127 mm) high

6. Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.
7. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
8. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
   a. Steel Hinges: Steel pins
   b. Non-Ferrous Hinges: Stainless steel pins
   c. Out-Swinging Exterior Doors: Non-removable pins
   d. Out-Swinging Interior Lockable Doors: Non-removable pins
   e. Interior Non-lockable Doors: Non-rising pins

9. Provide hinges with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component. Provide mortar guard for each electrified hinge specified.

2.04 ELECTRIC POWER TRANSFER

A. Manufacturers:

1. Scheduled Manufacturer and Product:
   a. Von Duprin EPT-10

B. Requirements:

1. Provide power transfer with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
2. Locate electric power transfer per manufacturer's template and UL requirements, unless interference with operation of door or other hardware items.

2.05 FLUSH BOLTS

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

B. Requirements:

1. Provide automatic, constant latching, and manual flush bolts with forged bronze or stainless-steel face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch (305 mm) steel or brass rods at doors up to 90 inches (2286 mm) in height. For doors over 90 inches (2286 mm) in height increase top rods by 6 inches (152 mm) for each additional 6 inches (152 mm) of door height. Provide dust-proof strikes at each bottom flush bolt.

2.06 COORDINATORS

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

B. Requirements:

1. Where pairs of doors are equipped with automatic flush bolts, an astragal, or other hardware that requires synchronized closing of the doors, provide bar-type coordinating device, surface applied to underside of stop at frame head.
2. Provide filler bar of correct length for unit to span entire width of opening, and appropriate brackets for parallel arm door closers, surface vertical rod exit device strikes, or other stop mounted hardware. Factory-prepared coordinators for vertical rod devices as specified.

2.07 CYLINDRICAL LOCKS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Schlage ND series

2. Acceptable Manufacturers and Products:
   a. No Substitute

B. Requirements:

1. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 1, and UL Listed for 3-hour fire doors.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2-inch latch throw. Provide proper latch throw for UL listing at pairs.
4. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
5. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
7. Provide electrified options as scheduled in the hardware sets.
8. Lever Trim: Solid cast levers without plastic inserts and wrought roses on both sides.
   a. Vandlgard: Provide levers with vandal resistant technology for use at heavy traffic or abusive applications.
   b. Lever Design: Schlage Sparta (SPA)

9. Specific room functions:
   a. Teacher, Staff and Adult single restrooms - ND40
   b. Classroom and Teacher Lounge doors – ND70
   c. Single user student restrooms off classrooms (eg. Kindergarten and Pre-K), Adult uni-sex restroom ahead of security vestibule at entrance only, clinic student restrooms, staff restroom inside kitchen area, staff restroom inside custodial restroom – ND40
   d. Communicating Classroom Doors – ND82

2.08 EXIT DEVICES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Von Duprin 99 series

2. Acceptable Manufacturers and Products:
   a. No Substitute

B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide grooved touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
4. Touchpad must extend a minimum of one half of door width. No plastic inserts are allowed in touchpads.

5. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements.
6. Provide exit devices with weather resistant components that can withstand harsh conditions of various climates and corrosive cleaners used in outdoor pool environments.
7. Provide flush end caps for exit devices.
8. Provide exit devices with manufacturer's approved strikes.
9. Provide exit devices cut to door width and height. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
10. Mount mechanism case flush on face of doors or provide spacers to fill gaps behind

devices. Where glass trim or molding projects off face of door, provide glass bead kits.
11. Provide cylinder or hex-key dogging as specified at non fire-rated openings.
12. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
13. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
14. Provide electrified options as scheduled.
15. Top latch mounting: double- or single-tab mount for steel doors, face mount for aluminum doors eliminating requirement of tabs, and double tab mount for wood doors.
16. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.

2.09 Keying Requirements

A. Key System: Schlage Primus XP utility-patented keyway on exterior doors only, conventional cylinders. Utility patent protection to extend at least until 2039. Key blanks available only from factory-direct sources, not available from after-market key blank manufacturers. For estimate use factory GMK charge. Initiate and conduct meetings(s) with Owner and I-R Security & Safety Consultants representatives to determine system key-way(s) and structure. Furnish Owner's written approval of the system.

1. Existing factory registered master key system.
2. Stamp all keys, cylinder plugs and core face with keyset symbol "VKC"
3. Supply 2 cut keys per cylinder
4. Supply 2 cut master keys for each master and grand master used in project.
5. Supply 100 key blanks.
6. Supply 500 electronic key fobs the design of which is specified by owner
7. Non-I.C. construction keying: furnish Split-key. At substantial completion, remove inserts in Owner's presence; demonstrate consequent non-operability of construction key. Give all removed inserts and all construction keys to Owner.
8. Furnish 10 construction keys.
9. Furnish 2 construction insert extractor tool 35-057.
10. Furnish 2 construction control keys.
11. Furnish (2) key cabinets and (2) tag filing systems, size of boxes to be determined by owner
12. Furnish 2 Grand Master Primus XP control keys
13. Furnish 20 P&S locking keys for light switches
14. All keys must be turned over to the District Locksmith with a transmittal sheet

B. At Substantial Completion, Contractor to remove inserts in Owner's presence and demonstrate consequent non-operability of construction key. Contractor to give all removed inserts and all construction keys to Owner. Owner's Disstrict locksmith will install permanent cylinders.

C. Bitting List: furnish secured shipment direct from point of origination to Owner's Director of Maintenance upon completion. Locksmith will set up key box; Contractor to hang key box in location(s) determined by Owner.

D. Initiate and conduct keying meeting(s) with Owner and I-R Security & Safety Consultants representatives to determine system keyway(s) and structure. Furnish Owner's written approval of the system

E. Key Cylinders: furnish conventional 6-pin solid brass construction by same manufacturer. New Construction shall all be FSIC removable core format for all interior locksets.

F. Furnish Schlage Primus XP interchangeable core cylinders for all exterior exit devices. Interior exit devices and mullions shall be non-Primus cores.

G. Cylinders/Cylinder cores: furnish keyed at factory of lock manufacturer where permanent records are maintained. Locks and cylinders same manufacturer and secure shipment direct to owner.

H. Permanent keys: furnish secured shipment direct from point of origination to Owner.

2.10 DOOR CLOSERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. LCN 4040XP series

2. Acceptable Manufacturers and Products:
   a. No Substitute

B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
3. Cylinder Body: 1-1/2-inch (38 mm) diameter piston with 5/8-inch (16 mm) diameter double heat-treated pinion journal. QR code with a direct link to maintenance instructions.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards. Provide snap-on cover clip, with plastic covers, that secures cover to spring tube.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck. Provide graphically labelled instructions on the closer body adjacent to each adjustment valve. Provide positive stop on reg valve that prevents reg screw from being backed out.
7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.
11. Heavy Duty arms (EDA) at exterior doors scheduled with parallel arm units.
12. All closers to be through bolted.
13. All teacher lounges to receive closer.
14. All exterior closers to be supplied with Cush Arms

2.11 DOOR TRIM

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

B. Requirements:

1. Provide push plates, push bars, pull plates, pulls, and hands-free reversible door pulls with diameter and length as scheduled.

2.12 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

B. Requirements:

1. Provide protection plates with a minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Sizes plates 2 inches (51 mm) less width of door on single doors, pairs of doors with a mullion, and doors with edge guards. Size plates 1 inch (25 mm) less width of door on pairs without a mullion or edge guards.
3. At fire rated doors, provide protection plates over 16 inches high with UL label.

2.13 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

A. Manufacturers:

1. Scheduled Manufacturers:
   a. Glynn-Johnson

B. Requirements:

1. Provide overhead stop at any door where conditions do not allow for a wall stop or floor stop presents tripping hazard.
2. Provide friction type at doors without closer and positive type at doors with closer.

2.14 DOOR STOPS AND HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide concave type where lockset has a push button of thumbturn.
2. Where a wall stop cannot be used, provide universal floor stops.
3. Where wall or floor stop cannot be used, provide overhead stop.
4. Provide roller bumper where doors open into each other and overhead stop cannot be used.

2.15 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Zero International

B. Requirements:

1. Provide thresholds, weather-stripping, and gasketing systems as specified and per architectural details. Match finish of other items.
2. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.
4. Size thresholds 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width unless otherwise specified in the hardware sets or detailed in the drawings.

2.16 SILENCERS

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.
2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.

3. Omit where gasketing is specified.

2.17 FINISHES

A. FINISH: BHMA 626/652 (US26D); EXCEPT:

1. Hinges at Exterior Doors: BHMA 630 (US32D)
2. Aluminum Geared Continuous Hinges: BHMA 628 (US28)
3. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
4. Protection Plates: BHMA 630 (US32D)
5. Overhead Stops and Holders: BHMA 630 (US32D)
6. Door Closers: Powder Coat to Match
7. Wall Stops: BHMA 630 (US32D)

8. Latch Protectors: BHMA 630 (US32D)
9. Weatherstripping: Clear Anodized Aluminum
10. Thresholds: Mill Finish Aluminum

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance. Verify doors, frames, and walls have been properly reinforced for hardware installation.

B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

C. Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
2. Custom Steel Doors and Frames: HMMA 831.
3. Interior Architectural Wood Flush Doors: ANSI/WDMA I.S. 1A
4. Installation Guide for Doors and Hardware: DHI TDH-007-20

B. Install door hardware in accordance with NFPA 80, NFPA 101 and provide post-install inspection, testing as specified in section 1.03.E unless otherwise required to comply with governing regulations.

C. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.

D. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.

E. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

F. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

G. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.

H. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated.

I. Lock Cylinders:

1. Install construction cores to secure building and areas during construction period.

2. Replace construction cores with permanent cores as indicated in keying section.
3. Furnish permanent cores to Owner for installation.

J. Wiring: Coordinate with Division 26, ELECTRICAL and Division 28 ELECTRONIC SAFETY AND SECURITY sections for:

1. Conduit, junction boxes and wire pulls.
2. Connections to and from power supplies to electrified hardware.
3. Connections to fire/smoke alarm system and smoke evacuation system.
4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
5. Connections to panel interface modules, controllers, and gateways.
6. Testing and labeling wires with Architect's opening number.

K. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

L. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.

M. Closer/Holders: Mount closer/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.

N. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.

O. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

P. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.

Q. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

R. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

S. Door Bottoms and Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

3.03 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

3.04 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items per manufacturer's instructions to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.05 DOOR HARDWARE SCHEDULE

A. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.

B. Discrepancies, conflicting hardware, and missing items are to be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application.

C. Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.

HARDWARE SETS:

142099 OPT0427773 Version 4
Hardware Group No. 001FLD - FOLDING DOOR/PARTITION
PROVIDE EACH FLD DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	FSIC MORTISE CYLINDER	20-061 ICX W/CONST. CORE QTY/TYPE AS REQD-COORDINATE W/ MFG	626	SCH
1	EA	FSIC PERMANENT CORE	23-030 VKC QTY/TYPE AS REQD-COORDINATE W/ MFG	626	SCH
1	EA	HARDWARE	REMAINDER OF HARDWARE BY DOOR MFG	FBO	UNK

COORDINATE LOCKING REQUIREMENTS WITH DOOR MANUFACTURER.

Hardware Group No. 001M-EXT - OVERHEAD DOOR / MOTORIZED (EXTERIOR)
PROVIDE EACH RU DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	FSIC MORTISE CYLINDER	20-061 ICX W/CONST. CORE QTY/TYPE REQD/COORD W/MFG	626	SCH
2	EA	FSIC PERMANENT CORE (EXT CORE)	20-740-XP VKC	626	SCH
2	EA	KEY SWITCH	(WHERE REQUIRED) PROVIDED BY SECTY CONTRACTOR TYPE REQD	630	SCE
	EA	HARDWARE	REMAINDER OF HARDWARE BY DOOR MFG	FBO	UNK

COORDINATE LOCKING REQUIREMENTS WITH DOOR MANUFACTURER.

Hardware Group No. 001M-INT - OVERHEAD DOOR / MOTORIZED (INTERIOR)
PROVIDE EACH RU DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	FSIC MORTISE CYLINDER	20-061 ICX W/CONST. CORE QTY/TYPE REQD/COORD W/MFG	626	SCH
2	EA	FSIC PERMANENT CORE	23-030 VKC QTY/TYPE REQD/COORD W/MFG	626	SCH
2	EA	KEY SWITCH	(WHERE REQUIRED) PROVIDED BY SECTY CONTRACTOR TYPE REQD	630	SCE
	EA	HARDWARE	REMAINDER OF HARDWARE BY DOOR MFG	FBO	UNK

COORDINATE LOCKING REQUIREMENTS WITH DOOR MANUFACTURER.

Hardware Group No. 103 - SGL OFFICE LOCK (OFF & FLEX)
PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP (OUTSWING)	652	IVE
1	EA	ENTRANCE LOCK	ND53TD SPA K510-066	626	SCH
1	EA	FSIC PERMANENT CORE	23-030 VKC	626	SCH
1	EA	DOOR STOP	FS448/ WS401CCV AS REQ	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

Hardware Group No. 200 - PAIR AFB/STOREROOM LOCK/CLSR/COORD
PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1HW 4.5 X 4.5 NRP (OUTSWING)	652	IVE
1	EA	AUTO FLUSH BOLT	FB31P/FB41P AS REQ	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	ND80TD SPA K510-066	626	SCH
1	EA	FSIC PERMANENT CORE	23-030 VKC	626	SCH
1	EA	COORDINATOR	COR X FL X MB X HW PREPS X LENGTH AS REQ	628	IVE
2	EA	SURFACE CLOSER	4040XP RW/PA TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
2	EA	DOOR STOP	FS448/ WS401CCV AS REQ	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER
1	EA	MEETING STILE	8193AA (2 PCS - 1 SET) HEIGHT AS REQ (OMIT @ NON-RATED DOORS)	AA	ZER

Hardware Group No. 200R - PAIR RTD AFB/STOREROOM LOCK/CLSR/COORD
PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1HW 4.5 X 4.5 NRP (OUTSWING)	652	IVE
1	EA	AUTO FLUSH BOLT	FB31P/FB41P AS REQ	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	ND80TD SPA 14-042 K510-066	626	SCH
1	EA	FSIC PERMANENT CORE	23-030 VKC	626	SCH
1	EA	COORDINATOR	COR X FL X MB X HW PREPS X LENGTH AS REQ	628	IVE
2	EA	SURFACE CLOSER	4040XP RW/PA TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
2	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
2	EA	DOOR STOP	FS448/ WS401CCV AS REQ	626	IVE
1	EA	GASKETING	488S PSA H & J	BK	ZER
2	EA	MEETING STILE	8193AA (2 PCS - 1 SET) HEIGHT AS REQ (OMIT @ NON-RATED DOORS)	AA	ZER

Hardware Group No. 201 - SGL STORAGE LOCK/CLSR
PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP (OUTSWING)	652	IVE
1	EA	STOREROOM LOCK	ND80TD SPA K510-066	626	SCH
1	EA	FSIC PERMANENT CORE	23-030 VKC	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	DOOR STOP	FS448/ WS401CCV AS REQ	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

Hardware Group No. 201WX - SGL STORAGE LOCK/CLSR - SMOKE
PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 5 X 4.5 NRP (OUTSWING)	652	IVE
1	EA	STOREROOM LOCK	ND80TD SPA K510-066	626	SCH
1	EA	FSIC PERMANENT CORE	23-030 VKC	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	DOOR STOP	FS448/ WS401CCV AS REQ	626	IVE
1	EA	GASKETING	488S PSA H & J	BK	ZER

Hardware Group No. 201X - SGL STORAGE LOCK/CLSR - SMOKE
PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP (OUTSWING)	652	IVE
1	EA	STOREROOM LOCK	ND80TD SPA K510-066	626	SCH
1	EA	FSIC PERMANENT CORE	23-030 VKC	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	DOOR STOP	FS448/ WS401CCV AS REQ	626	IVE
1	EA	GASKETING	488S PSA H & J	BK	ZER

Hardware Group No. 203 - SGL STORAGE LOCK
PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP (OUTSWING)	652	IVE
1	EA	STOREROOM LOCK	ND80TD SPA K510-066	626	SCH
1	EA	FSIC PERMANENT CORE	23-030 VKC	626	SCH
1	EA	DOOR STOP	FS448/ WS401CCV AS REQ	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

Hardware Group No. 203G - SGL STORAGE LOCK
PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP (OUTSWING)	652	IVE
1	EA	STOREROOM LOCK	ND80TD SPA K510-066	626	SCH
1	EA	FSIC PERMANENT CORE	23-030 VKC	626	SCH
1	EA	DOOR STOP	FS448/ WS401CCV AS REQ	626	IVE
1	EA	GASKETING	488S PSA H & J	BK	ZER
1	EA	DOOR BOTTOM	369AA/355AA-Z49 (WD/MD AS REQ)	AA	ZER
1	EA	THRESHOLD	545A-FRAME WIDTH	A	ZER

Hardware Group No. 203GS - SGL STORAGE LOCK OHS
PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP (OUTSWING)	652	IVE
1	EA	STOREROOM LOCK	ND80TD SPA K510-066	626	SCH
1	EA	FSIC PERMANENT CORE	23-030 VKC	626	SCH
1	EA	OH STOP	900S SERIES X SIZE & MOUNTING AS REQ	630	GLY
1	EA	GASKETING	488S PSA H & J	BK	ZER
1	EA	DOOR BOTTOM	369AA/355AA-Z49 (WD/MD AS REQ)	AA	ZER
1	EA	THRESHOLD	545A-FRAME WIDTH	A	ZER

Hardware Group No. 203GW - SGL STORAGE LOCK
PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 5 X 4.5 NRP (OUTSWING)	652	IVE
1	EA	STOREROOM LOCK	ND80TD SPA K510-066	626	SCH
1	EA	FSIC PERMANENT CORE	23-030 VKC	626	SCH
1	EA	DOOR STOP	FS448/ WS401CCV AS REQ	626	IVE
1	EA	GASKETING	488S PSA H & J	BK	ZER
1	EA	DOOR BOTTOM	369AA/355AA-Z49 (WD/MD AS REQ)	AA	ZER
1	EA	THRESHOLD	545A-FRAME WIDTH	A	ZER

Hardware Group No. 203W - SGL STORAGE LOCK
PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 5 X 4.5 NRP (OUTSWING)	652	IVE
1	EA	STOREROOM LOCK	ND80TD SPA K510-066	626	SCH
1	EA	FSIC PERMANENT CORE	23-030 VKC	626	SCH
1	EA	DOOR STOP	FS448/ WS401CCV AS REQ	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

Hardware Group No. 212 - PAIR STOREROOM LOCK/CONST LATCH/FLOOR STOP
PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1HW 4.5 X 4.5 NRP (OUTSWING)	652	IVE
1	EA	CONST LATCHING BOLT	FB51P/FB61P AS REQ	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	ND80TD SPA K510-066	626	SCH
1	EA	FSIC PERMANENT CORE	23-030 VKC	626	SCH
2	EA	DOOR STOP	FS448/ WS401CCV AS REQ	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER
2	EA	MEETING STILE	8193AA (2 PCS - 1 SET) HEIGHT AS REQ (OMIT @ NON-RATED DOORS)	AA	ZER

Hardware Group No. 301G - SGL PRIVACY/CLSR/488S-SEAL (TYP CORR/STF) NO INDICATOR????
PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP (OUTSWING)	652	IVE
1	EA	PRIVACY LOCK	ND40S SPA K510-066	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	DOOR STOP	FS448/ WS401CCV AS REQ	626	IVE
1	EA	GASKETING	488S PSA H & J	BK	ZER

Hardware Group No. 303G - SGL PRIVACY/488S-SEAL (INSIDE ROOMS/CLSSRMS) NO INDICATOR????
PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP (OUTSWING)	652	IVE
1	EA	PRIVACY LOCK	ND40S SPA K510-066	626	SCH
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	DOOR STOP	FS448/ WS401CCV AS REQ	626	IVE
1	EA	GASKETING	488S PSA H & J	BK	ZER

Hardware Group No. 403 - SGL PASSAGE
PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP (OUTSWING)	652	IVE
1	EA	PASSAGE SET	ND10S SPA K510-066	626	SCH
1	EA	DOOR STOP	FS448/ WS401CCV AS REQ	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

Hardware Group No. 501A - SGL CLASSROOM LOCK/CLSR (ALSF) - STAFF/WORK AREA, WKRM, LOUNGE, CONNECT-CLSSRMS
PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	PIVOT SET	7215 SET	626	IVE
1	EA	INTERMEDIATE PIVOT	7215 INT	626	IVE
1	EA	CLASSROOM LOCK	ND70TD SPA K510-066	626	SCH
1	EA	FSIC PERMANENT CORE	23-030 VKC	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	DOOR STOP	FS448/ WS401CCV AS REQ	626	IVE
1	SET	SEAL	PERIMETER SEAL BY FRAME MANUFACTURER		

Hardware Group No. 503 - TYPICAL CLASSROOM (ND70)
PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP (OUTSWING)	652	IVE
1	EA	CLASSROOM LOCK	ND70TD SPA K510-066	626	SCH
1	EA	FSIC PERMANENT CORE	23-030 VKC	626	SCH
1	EA	DOOR STOP	FS448/ WS401CCV AS REQ	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

Hardware Group No. 503S - TYPICAL CLASSROOM (ND70) OHS
PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP (OUTSWING)	652	IVE
1	EA	CLASSROOM LOCK	ND70TD SPA K510-066	626	SCH
1	EA	FSIC PERMANENT CORE	23-030 VKC	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. 507 - SGL CLASSROOM LOCK/CLSR - STAFF/WORK AREA, WKRM, LOUNGE, CONNECT-CLSSRMS
PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP (OUTSWING)	652	IVE
1	EA	CLASSROOM LOCK	ND70TD SPA K510-066	626	SCH
1	EA	FSIC PERMANENT CORE	23-030 VKC	626	SCH
1	EA	OH STOP	900S SERIES X SIZE & MOUNTING AS REQ	630	GLY
1	EA	SURFACE CLOSER	4040XP RW/PA TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

Hardware Group No. 700ACM - PAIR PANIC (ALSF) LIBRY,GYM,CAFE & LG-CLASSRM (99-L-17)
PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	PIVOT SET	7215 SET	626	IVE
2	EA	INTERMEDIATE PIVOT	7215 INT	626	IVE
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
2	EA	PANIC HARDWARE	99-L-17	626	VON
1	EA	MULLION STORAGE KIT	MT54	689	VON
2	EA	FSIC RIM CYLINDER	20-057 ICX W/CONST. CORE	626	SCH
1	EA	FSIC MORTISE CYLINDER	20-061 ICX W/CONST. CORE	626	SCH
3	EA	FSIC PERMANENT CORE	23-030 VKC	626	SCH
2	EA	SURFACE CLOSER	4040XP SCUSH TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
	SET	SEAL	PERIMETER SEAL BY FRAME MANUFACTURER		
	SET	ASTRAGAL	MEETING STILE SEAL BY DOOR MFR		

Hardware Group No. 700CM - PAIR PANIC - LIBRY,GYM,CAFE & LG-CLASSRM (99-L-17)
PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1HW 4.5 X 4.5 NRP (OUTSWING)	652	IVE
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
2	EA	PANIC HARDWARE	99-L-17	626	VON
1	EA	MULLION STORAGE KIT	MT54	689	VON
2	EA	FSIC RIM CYLINDER	20-057 ICX W/CONST. CORE	626	SCH
1	EA	FSIC MORTISE CYLINDER	20-061 ICX W/CONST. CORE	626	SCH
3	EA	FSIC PERMANENT CORE	23-030 VKC	626	SCH
2	EA	SURFACE CLOSER	4040XP SCUSH TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER

Hardware Group No. 700M - PAIR PANIC - LIBRY,GYM,CAFE & LG-CLASSRM (99-L-17)
PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1HW 4.5 X 4.5 NRP (OUTSWING)	652	IVE
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
2	EA	PANIC HARDWARE	99-L-17	626	VON
1	EA	MULLION STORAGE KIT	MT54	689	VON
2	EA	FSIC RIM CYLINDER	20-057 ICX W/CONST. CORE	626	SCH
1	EA	FSIC MORTISE CYLINDER	20-061 ICX W/CONST. CORE	626	SCH
3	EA	FSIC PERMANENT CORE	23-030 VKC	626	SCH
2	EA	SURFACE CLOSER	4040XP RW/PA TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
2	EA	DOOR STOP	FS448/ WS401CCV AS REQ	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER

Hardware Group No. 701 - SGL PANIC - LG-CLASSRM (99-L-17)
PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP (OUTSWING)	652	IVE
1	EA	PANIC HARDWARE	99-L-17	626	VON
1	EA	FSIC RIM CYLINDER	20-057 ICX W/CONST. CORE	626	SCH
1	EA	FSIC PERMANENT CORE	23-030 VKC	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	DOOR STOP	FS448/ WS401CCV AS REQ	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

Hardware Group No. 701AC - SGL PANIC (ALSF) - LG-CLASSRM (99-L-17)
PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	PIVOT SET	7215 SET	626	IVE
1	EA	INTERMEDIATE PIVOT	7215 INT	626	IVE
1	EA	PANIC HARDWARE	99-L-17	626	VON
1	EA	FSIC RIM CYLINDER	20-057 ICX W/CONST. CORE	626	SCH
1	EA	FSIC PERMANENT CORE	23-030 VKC	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	SET	SEAL	PERIMETER SEAL BY FRAME MANUFACTURER		

Hardware Group No. 701X - SGL PANIC (SMOKE) - LG-CLASSRM (LD-99-L-17)
PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP (OUTSWING)	652	IVE
1	EA	PANIC HARDWARE	LD-99-L-17	626	VON
1	EA	FSIC RIM CYLINDER	20-057 ICX W/CONST. CORE	626	SCH
1	EA	FSIC PERMANENT CORE	23-030 VKC	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	DOOR STOP	FS448/ WS401CCV AS REQ	626	IVE
1	EA	GASKETING	488S PSA H & J	BK	ZER

Hardware Group No. 711EL - SGL PANIC - ELEC RM (LD-99-L-NL-17)
PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP (OUTSWING)	652	IVE
1	EA	PANIC HARDWARE	LD-99-L-NL-17	626	VON
1	EA	FSIC RIM CYLINDER	20-057 ICX W/CONST. CORE	626	SCH
1	EA	FSIC PERMANENT CORE	23-030 VKC	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	DOOR STOP	FS448/ WS401CCV AS REQ	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

Hardware Group No. 738RW - PAIR (RTD) PANIC - CORR MHO (99-L-BE-F-17/KR9954)
PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1HW 5 X 4.5 NRP (OUTSWING)	630	IVE
1	EA	FIRE RATED REMOVABLE MULLION	KR9954 STAB	689	VON
2	EA	FIRE EXIT HARDWARE	99-L-BE-F-17	626	VON
1	EA	MULLION STORAGE KIT	MT54	689	VON
1	EA	FSIC MORTISE CYLINDER	20-061 ICX W/CONST. CORE	626	SCH
1	EA	FSIC PERMANENT CORE	23-030 VKC	626	SCH
2	EA	FIRE/LIFE CLOSER	4040SE WMS X MTG BRKT,SPCR & PLATE AS REQ OPTION SEE 4040XP/SEM7800	689	LCN
2	EA	SURFACE CLOSER	4040XP RW/PA TBSRT X MTG BRKT, SPCR & PLATE AS REQ 4040XP/SEM7800 (OR) 4040SE	689	LCN
2	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
2	EA	FIRE/LIFE WALL MAG	SEM7800 SERIES AS REQ 4040XP/SEM7800 (OR) 4040SE	689	LCN
1	EA	MULLION SEAL	139N PSA HEIGHT AS REQ		ZER
1	EA	GASKETING	488S PSA H & J	BK	ZER
1	EA	POWER SUPPLY	PS902 FA900 120/240 VAC (BY DIVISION 28 13 00)	LGR	SCE

-PROVIDE 120VAC AND FIRE ALARM CONNECTIONS FOR HOLD OPENS.
-WIRE HOLD OPENS TO THE FIRE ALARM SYSTEM.
-HOLD OPENS ARE TO RELEASE UPON ACTIVATION OF THE FIRE ALARMS SYSTEM.

Hardware Group No. 801LCG - SGL PUSH/PULL/CLSR/DEADLOCK (MULTI-STALL RESTROOM) 488 GASKET
PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP (OUTSWING)	652	IVE
1	EA	CLASSROOM DEADBOLT	B663T	626	SCH
1	EA	FSIC PERMANENT CORE	23-030 VKC	626	SCH
1	EA	PUSH PLATE	8200 4" X 16"	630	IVE
1	EA	PULL PLATE	8303 10" 4" X 16"	630	IVE
1	EA	SURFACE CLOSER	4040XP SCUSH TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

Hardware Group No. 801LG - SGL PUSH/PULL/CLSR/DEADLOCK (MULTI-STALL RESTROOM) 488 GASKET
PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP (OUTSWING)	652	IVE
1	EA	CLASSROOM DEADBOLT	B663T	626	SCH
1	EA	FSIC PERMANENT CORE	23-030 VKC	626	SCH
1	EA	PUSH PLATE	8200 4" X 16"	630	IVE
1	EA	PULL PLATE	8303 10" 4" X 16"	630	IVE
1	EA	SURFACE CLOSER	4040XP RW/PA TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	DOOR STOP	FS448/ WS401CCV AS REQ	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

Hardware Group No. C201 - SGL STORAGE LOCK/CLSR (ACCESS CONTROLLED)
PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP (OUTSWING)	652	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	ELECTRIFIED LOCK (FAIL SECURE)	ND80TDEU SPA K510-066 RX CON 12V/24V DC	626	SCH
1	EA	FSIC PERMANENT CORE	23-030 VKC	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	DOOR STOP	FS448/ WS401CCV AS REQ	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER
1	EA	HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
1	EA	HARNESS (TO POWER SUPPLY)	CON-6W - CONNECTION LEADS		SCH
1	EA	MULTITECH READER	MT11/MT15 AS REQ (BY DIV 28 13 00)	BLK	SCE
1	EA	DOOR CONTACT	679-05 AS REQ (BY DIVISION 28 13 00)	WHT	SCE
1	EA	POWER SUPPLY	PS902 BBK 900-2RS (BY DIVISION 28 13 00)	LGR	SCE

OPERATIONAL DESCRIPTION: ENTRANCE BY CREDENTIAL READER OR MANUAL KEY OVER-RIDE. ALWAYS FREE EGRESS. FAIL SECURE.

Hardware Group No. C201C - SGL STORAGE LOCK/CLSR (ACCESS CONTROLLED)
PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP (OUTSWING)	652	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	ELECTRIFIED LOCK (FAIL SECURE)	ND80TDEU SPA K510-066 RX CON 12V/24V DC	626	SCH
1	EA	FSIC PERMANENT CORE	23-030 VKC	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER
1	EA	HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
1	EA	HARNESS (TO POWER SUPPLY)	CON-6W - CONNECTION LEADS		SCH
1	EA	MULTITECH READER	MT11/MT15 AS REQ (BY DIV 28 13 00)	BLK	SCE
1	EA	DOOR CONTACT	679-05 AS REQ (BY DIVISION 28 13 00)	WHT	SCE
1	EA	POWER SUPPLY	PS902 BBK 900-2RS (BY DIVISION 28 13 00)	LGR	SCE

OPERATIONAL DESCRIPTION: ENTRANCE BY CREDENTIAL READER OR MANUAL KEY OVER-RIDE. ALWAYS FREE EGRESS. FAIL SECURE.

Hardware Group No. C201W - SGL STORAGE LOCK/CLSR (ACCESS CONTROLLED)
PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 5 X 4.5 NRP (OUTSWING)	652	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	ELECTRIFIED LOCK (FAIL SECURE)	ND80TDEU SPA K510-066 RX CON 12V/24V DC	626	SCH
1	EA	FSIC PERMANENT CORE	23-030 VKC	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	DOOR STOP	FS448/ WS401CCV AS REQ	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER
1	EA	HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
1	EA	HARNESS (TO POWER SUPPLY)	CON-6W - CONNECTION LEADS		SCH
1	EA	MULTITECH READER	MT11/MT15 AS REQ (BY DIV 28 13 00)	BLK	SCE
1	EA	DOOR CONTACT	679-05 AS REQ (BY DIVISION 28 13 00)	WHT	SCE
1	EA	POWER SUPPLY	PS902 BBK 900-2RS (BY DIVISION 28 13 00)	LGR	SCE

OPERATIONAL DESCRIPTION: ENTRANCE BY CREDENTIAL READER OR MANUAL KEY OVER-RIDE. ALWAYS FREE EGRESS. FAIL SECURE.

Hardware Group No. C205 - SGL EXTERIOR STORAGE LOCK (ACCESS CONTROLLED) PUMP,MECH, RISER
PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP (OUTSWING)	630	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	ELECTRIFIED LOCK (FAIL SECURE)	ND80TDEU SPA K510-066 RX CON 12V/24V DC	626	SCH
1	EA	FSIC PERMANENT CORE (EXT CORE)	20-740-XP VKC	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH SRI TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	RAIN DRIP	142A DW + 4"	AA	ZER
1	SET	GASKETING SET	328AA-S H & J	AA	ZER
1	EA	DOOR SWEEP	39A-DOOR WIDTH	A	ZER
1	EA	THRESHOLD	65A-V3-226 FRAME WIDTH	A	ZER
1	EA	HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
1	EA	HARNESS (TO POWER SUPPLY)	CON-6W - CONNECTION LEADS		SCH
1	EA	MULTITECH READER	MT11/MT15 AS REQ (BY DIV 28 13 00)	BLK	SCE
1	EA	DOOR CONTACT	679-05 AS REQ (BY DIVISION 28 13 00)	WHT	SCE
1	EA	POWER SUPPLY	PS902 BBK 900-2RS (BY DIVISION 28 13 00)	LGR	SCE

OPERATIONAL DESCRIPTION: ENTRANCE BY CREDENTIAL READER OR MANUAL KEY OVER-RIDE. ALWAYS FREE EGRESS. FAIL SECURE.

Hardware Group No. C205A - SGL EXTERIOR ALSF SR LOCK (ACCESS CONTROLLED)
PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	PIVOT SET	7215 SET	626	IVE
1	EA	INTERMEDIATE PIVOT	7215 INT	626	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	ELECTRIFIED LOCK (FAIL SECURE)	ND80TDEU SPA K510-066 RX CON 12V/24V DC	626	SCH
1	EA	FSIC PERMANENT CORE (EXT CORE)	20-740-XP VKC	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH SRI TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	RAIN DRIP	142A DW + 4"	AA	ZER
	SET	SEAL	PERIMETER SEAL BY FRAME MANUFACTURER		
1	EA	DOOR SWEEP	39A-DOOR WIDTH	A	ZER
1	EA	THRESHOLD	65A-V3-226 FRAME WIDTH	A	ZER
1	EA	HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
1	EA	HARNESS (TO POWER SUPPLY)	CON-6W - CONNECTION LEADS		SCH
1	EA	MULTITECH READER	MT11/MT15 AS REQ (BY DIV 28 13 00)	BLK	SCE
1	EA	DOOR CONTACT	679-05 AS REQ (BY DIVISION 28 13 00)	WHT	SCE
1	EA	POWER SUPPLY	PS902 BBK 900-2RS (BY DIVISION 28 13 00)	LGR	SCE

OPERATIONAL DESCRIPTION: ENTRANCE BY CREDENTIAL READER OR MANUAL KEY OVER-RIDE. ALWAYS FREE EGRESS. FAIL SECURE.

Hardware Group No. C214 - PAIR EXTERIOR STORAGE LOCK (ACCESS CONTROLLED) PUMP,MECH,RISER,MEZZ
PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1HW 4.5 X 4.5 NRP (OUTSWING)	630	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
2	EA	MANUAL FLUSH BOLT	FB458-12"	626	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	ELECTRIFIED LOCK (FAIL SECURE)	ND80TDEU SPA K510-066 RX CON 12V/24V DC	626	SCH
1	EA	FSIC PERMANENT CORE (EXT CORE)	20-740-XP VKC	626	SCH
2	EA	SURFACE CLOSER	4040XP SCUSH SRI TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
2	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	RAIN DRIP	142A DW + 4"	AA	ZER
2	SET	GASKETING SET	328AA-S H & J	AA	ZER
1	EA	OVERLAPPING ASTRAGAL	383AA-DOOR HEIGHT (OR AS REQD BY DR MFG)	AA	ZER
2	EA	DOOR SWEEP	39A-DOOR WIDTH	A	ZER
1	EA	THRESHOLD	65A-V3-226 FRAME WIDTH	A	ZER
1	EA	HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
1	EA	HARNESS (TO POWER SUPPLY)	CON-6W - CONNECTION LEADS		SCH
1	EA	MULTITECH READER	MT11/MT15 AS REQ (BY DIV 28 13 00)	BLK	SCE
2	EA	DOOR CONTACT	679-05 AS REQ (BY DIVISION 28 13 00)	WHT	SCE
1	EA	POWER SUPPLY	PS904 BBK 900-4RL (BY DIVISION 28 13 00)	LGR	SCE

OPERATIONAL DESCRIPTION: ENTRANCE BY CREDENTIAL READER OR MANUAL KEY OVER-RIDE. ALWAYS FREE EGRESS. FAIL SECURE.

Hardware Group No. C714AM - PAIR EXTER PANIC (ALSF) (ACCESS CONTROLLED) 2-RX-QEL/99-VR/KR4954/DC
PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	PIVOT SET	7215 SET	626	IVE
2	EA	INTERMEDIATE PIVOT	7215 INT	626	IVE
2	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
2	EA	ELEC PANIC HARDWARE	RX-QEL-99-EO-CON 24 VDC	626	VON
1	EA	MULLION STORAGE KIT	MT54	689	VON
1	EA	FSIC RIM CYLINDER	20-057 ICX W/CONST. CORE	626	SCH
1	EA	FSIC MORTISE CYLINDER	20-061 ICX W/CONST. CORE	626	SCH
1	EA	FSIC PERMANENT CORE (EXT CORE)	20-740-XP VKC	626	SCH
1	EA	FSIC PERMANENT CORE	23-030 VKC	626	SCH
1	EA	DOOR PULL	VR910 DT (INACTIVE LEAF)	630	IVE
1	EA	DOOR PULL	VR910 NL	630	IVE
2	EA	SURFACE CLOSER	4040XP SCUSH SRI TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	MULLION SEAL	139N PSA HEIGHT AS REQ		ZER
1	EA	RAIN DRIP	142A DW + 4"	AA	ZER
	SET	SEAL	PERIMETER SEAL BY FRAME MANUFACTURER		
	SET	ASTRAGAL	MEETING STILE SEAL BY DOOR MFR		
2	EA	DOOR SWEEP	39A-DOOR WIDTH	A	ZER
1	EA	THRESHOLD	655A-EV3-226 FRAME WIDTH	A	ZER
2	EA	HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
2	EA	HARNESS (TO POWER SUPPLY)	CON-6W - CONNECTION LEADS		SCH
1	EA	MULTITECH READER	MT11/MT15 AS REQ (BY DIV 28 13 00)	BLK	SCE
2	EA	DOOR CONTACT	679-05 AS REQ (BY DIVISION 28 13 00)	WHT	SCE
1	EA	POWER SUPPLY	PS904 BBK 900-4RL (BY DIVISION 28 13 00)	LGR	SCE

OPERATIONAL DESCRIPTION: ENTRANCE BY CREDENTIAL READER OR MANUAL KEY OVER-RIDE. ALWAYS FREE EGRESS. FAIL SECURE.

Hardware Group No. C714M - PAIR EXTER PANIC (HM) (ACCESS CONTROLLED) 2-RX-QEL/99-VR/KR4954/DC
PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1HW 4.5 X 4.5 NRP (OUTSWING)	630	IVE
2	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
2	EA	ELEC PANIC HARDWARE	RX-QEL-99-EO-CON 24 VDC	626	VON
1	EA	MULLION STORAGE KIT	MT54	689	VON
1	EA	FSIC RIM CYLINDER	20-057 ICX W/CONST. CORE	626	SCH
1	EA	FSIC MORTISE CYLINDER	20-061 ICX W/CONST. CORE	626	SCH
1	EA	FSIC PERMANENT CORE (EXT CORE)	20-740-XP VKC	626	SCH
1	EA	FSIC PERMANENT CORE	23-030 VKC	626	SCH
1	EA	DOOR PULL	VR910 DT	630	IVE
1	EA	DOOR PULL	VR910 NL	630	IVE
2	EA	SURFACE CLOSER	4040XP SCUSH SRI TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
2	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	MULLION SEAL	139N PSA HEIGHT AS REQ		ZER
1	EA	RAIN DRIP	142A DW + 4"	AA	ZER
2	SET	GASKETING SET	328AA-S H & J	AA	ZER
2	EA	DOOR SWEEP	39A-DOOR WIDTH	A	ZER
1	EA	THRESHOLD	655A-EV3-226 FRAME WIDTH	A	ZER
2	EA	VIEWER	698 (WHERE APPLICABLE/FLUSH DR)	626	IVE
2	EA	HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
2	EA	HARNESS (TO POWER SUPPLY)	CON-6W - CONNECTION LEADS		SCH
1	EA	MULTITECH READER	MT11/MT15 AS REQ (BY DIV 28 13 00)	BLK	SCE
2	EA	DOOR CONTACT	679-05 AS REQ (BY DIVISION 28 13 00)	WHT	SCE
1	EA	POWER SUPPLY	PS904 BBK 900-4RL (BY DIVISION 28 13 00)	LGR	SCE

OPERATIONAL DESCRIPTION: ENTRANCE BY CREDENTIAL READER OR MANUAL KEY OVER-RIDE. ALWAYS FREE EGRESS. FAIL SECURE.

Hardware Group No. C715A - SGL EXTER PANIC (ALSF) (ACCESS CONTROLLED) RX-QEL/99-VR/DC
PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	PIVOT SET	7215 SET	626	IVE
1	EA	INTERMEDIATE PIVOT	7215 INT	626	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-99-EO-CON 24 VDC	626	VON
1	EA	FSIC RIM CYLINDER	20-057 ICX W/CONST. CORE	626	SCH
1	EA	FSIC PERMANENT CORE (EXT CORE)	20-740-XP VKC	626	SCH
1	EA	DOOR PULL	VR910 NL	630	IVE
1	EA	SURFACE CLOSER	4040XP SCUSH SRI TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	RAIN DRIP	142A DW + 4"	AA	ZER
	SET	SEAL	PERIMETER SEAL BY FRAME MANUFACTURER		
1	EA	DOOR SWEEP	39A-DOOR WIDTH	A	ZER
1	EA	THRESHOLD	655A-EV3-226 FRAME WIDTH	A	ZER
1	EA	HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
1	EA	HARNESS (TO POWER SUPPLY)	CON-6W - CONNECTION LEADS		SCH
1	EA	MULTITECH READER	MT11/MT15 AS REQ (BY DIV 28 13 00)	BLK	SCE
1	EA	DOOR CONTACT	679-05 AS REQ (BY DIVISION 28 13 00)	WHT	SCE
1	EA	POWER SUPPLY	PS902 BBK 900-2RS (BY DIVISION 28 13 00)	LGR	SCE

OPERATIONAL DESCRIPTION: ENTRANCE BY CREDENTIAL READER OR MANUAL KEY OVER-RIDE. ALWAYS FREE EGRESS. FAIL SECURE.

Hardware Group No. C715VW - SGL EXTER PANIC (HM) (ACCESS CONTROLLED) RX-QEL/99-VR/ARMOR/VIEWR/DC (KITCH)
PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 5 X 4.5 NRP (OUTSWING)	630	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-99-EO-CON	626	VON
1	EA	FSIC RIM CYLINDER	20-057 ICX W/CONST. CORE	626	SCH
1	EA	FSIC PERMANENT CORE (EXT CORE)	20-740-XP VKC	626	SCH
1	EA	DOOR PULL	VR910 NL	630	IVE
1	EA	SURFACE CLOSER	4040XP SCUSH SRI TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	RAIN DRIP	142A DW + 4"	AA	ZER
1	SET	GASKETING SET	328AA-S H & J	AA	ZER
1	EA	DOOR SWEEP	39A-DOOR WIDTH	A	ZER
1	EA	THRESHOLD	655A-EV3-226 FRAME WIDTH	A	ZER
2	EA	VIEWER	698 (WHERE APPLICABLE/FLUSH DR)	626	IVE
1	EA	HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
1	EA	HARNESS (TO POWER SUPPLY)	CON-6W (CONNECTION LEADS)		SCH
1	EA	MULTITECH READER	MT11/MT15 (BY DIVISION 28 13 00)	BLK	SCE
1	EA	DOOR CONTACT	679-05 AS REQ (BY DIVISION 28 13 00)	WHT	SCE
1	EA	POWER SUPPLY	PS902 BBK 900-2RS (BY DIVISION 28 13 00)	LGR	SCE

OPERATIONAL DESCRIPTION: ENTRANCE BY CREDENTIAL READER OR MANUAL KEY OVER-RIDE. ALWAYS FREE EGRESS. FAIL SECURE.

Hardware Group No. CR201 - SGL STORAGE LOCK/CLSR (ACCESS CONTROLLED/REMOTE RELEASE)
PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP (OUTSWING)	652	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	ELECTRIFIED LOCK (FAIL SECURE)	ND80TDEU SPA K510-066 RX CON 12V/24V DC	626	SCH
1	EA	FSIC PERMANENT CORE	23-030 VKC	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	DOOR STOP	FS448/ WS401CCV AS REQ	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER
1	EA	HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
1	EA	HARNESS (TO POWER SUPPLY)	CON-6W - CONNECTION LEADS		SCH
1	EA	MULTITECH READER	MT11/MT15 AS REQ (BY DIV 28 13 00)	BLK	SCE
1	EA	REMOTE RELEASE BUTTON	BY DIVISION 28 13 00	628	SCE
1	EA	DOOR CONTACT	679-05 AS REQ (BY DIVISION 28 13 00)	WHT	SCE
1	EA	POWER SUPPLY	PS902 BBK 900-2RS (BY DIVISION 28 13 00)	LGR	SCE

OPERATIONAL DESCRIPTION: ENTRANCE BY CREDENTIAL READER OR MANUAL KEY OVER-RIDE. ALWAYS FREE EGRESS. FAIL SECURE.

Hardware Group No. CR207 - SGL STORAGE LOCK/CLSR (ACCESS CONTROLLED/REMOTE RELEASE) 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 NRP (OUTSWING)	652	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	ELECTRIFIED LOCK (FAIL SECURE)	ND80TDEU SPA K510-066 RX CON 12V/24V DC	626	SCH
1	EA	FSIC PERMANENT CORE	23-030 VKC	626	SCH
1	EA	OH STOP	100S SERIES X SIZE & MOUNTING AS REQ	630	GLY
1	EA	SURFACE CLOSER	4040XP RW/PA TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER
1	EA	HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
1	EA	HARNESS (TO POWER SUPPLY)	CON-6W - CONNECTION LEADS		SCH
1	EA	MULTITECH READER	MT11/MT15 AS REQ (BY DIV 28 13 00)	BLK	SCE
1	EA	REMOTE RELEASE BUTTON	BY DIVISION 28 13 00	628	SCE
1	EA	DOOR CONTACT	679-05 AS REQ (BY DIVISION 28 13 00)	WHT	SCE
1	EA	POWER SUPPLY	PS902 BBK 900-2RS (BY DIVISION 28 13 00)	LGR	SCE

OPERATIONAL DESCRIPTION: ENTRANCE BY CREDENTIAL READER OR MANUAL KEY OVER-RIDE. ALWAYS FREE EGRESS. FAIL SECURE.

Hardware Group No. CR207A - SGL (ALSF) STORAGE LOCK/CLSR (ACCESS CONTROLLED/REMOTE RELEASE) OH STOP
PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	PIVOT SET	7215 SET	626	IVE
1	EA	INTERMEDIATE PIVOT	7215 INT	626	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	EU STOREROOM LOCK	ND80TDEU SPA K510-066 RX CON 12V/24V DC	626	SCH
1	EA	FSIC PERMANENT CORE	23-030 VKC	626	SCH
1	EA	OH STOP	100S SERIES X SIZE & MOUNTING AS REQ	630	GLY
1	EA	SURFACE CLOSER	4040XP RW/PA TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
	SET	SEAL	PERIMETER SEAL BY FRAME MANUFACTURER		
1	EA	HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
1	EA	HARNESS (TO POWER SUPPLY)	CON-6W (CONNECTION LEADS)		SCH
1	EA	MULTITECH READER	MT11/MT15 (BY DIVISION 28 13 00)	BLK	SCE
1	EA	INTERCOM / BUZZER	BY DIVISION 28 13 00		B/O
1	EA	REMOTE RELEASE BUTTON	BY DIVISION 28 13 00	628	SCE
1	EA	DOOR CONTACT	679-05 AS REQ (BY DIVISION 28 13 00)	WHT	SCE
1	EA	POWER SUPPLY	PS902 BBK 900-2RS (BY DIVISION 28 13 00)	LGR	SCE

OPERATIONAL DESCRIPTION: ENTRANCE BY CREDENTIAL READER OR MANUAL KEY OVER-RIDE. REMOTE CONTROL BY ACCESS CONTROL SYSTEM OR DESK BUTTON RELEASE AT RECEPTION. ALWAYS FREE EGRESS. FAIL SECURE.

Hardware Group No. CR710AMV - PAIR VEST PANIC (ALSF) (ACCESS CONTROLLED/REMOTE) 2-RX-QEL/99-VR/KR4954/
PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	PIVOT SET	7215 SET	626	IVE
2	EA	INTERMEDIATE PIVOT	7215 INT	626	IVE
2	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
2	EA	ELEC PANIC HARDWARE	RX-QEL-99-EO-CON 24 VDC	626	VON
1	EA	MULLION STORAGE KIT	MT54	689	VON
1	EA	FSIC RIM CYLINDER	20-057 ICX W/CONST. CORE	626	SCH
1	EA	FSIC MORTISE CYLINDER	20-061 ICX W/CONST. CORE	626	SCH
2	EA	FSIC PERMANENT CORE	23-030 VKC	626	SCH
1	EA	DOOR PULL	VR910 DT	630	IVE
1	EA	DOOR PULL	VR910 NL	630	IVE
2	EA	SURFACE CLOSER	4040XP SCUSH TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	MULLION SEAL	139N PSA HEIGHT AS REQ		ZER
	SET	SEAL	PERIMETER SEAL BY FRAME MANUFACTURER		
2	EA	HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
2	EA	HARNESS (TO POWER SUPPLY)	CON-6W - CONNECTION LEADS		SCH
1	EA	MULTITECH READER	MT11/MT15 AS REQ (BY DIV 28 13 00)	BLK	SCE
1	EA	REMOTE RELEASE BUTTON	BY DIVISION 28 13 00	628	SCE
2	EA	DOOR CONTACT	679-05 AS REQ (BY DIVISION 28 13 00)	WHT	SCE
1	EA	POWER SUPPLY	PS904 BBK 900-4RL (BY DIVISION 28 13 00)	LGR	SCE

OPERATIONAL DESCRIPTION: ENTRANCE BY CREDENTIAL READER OR MANUAL KEY OVER-RIDE. REMOTE CONTROL BY ACCESS CONTROL SYSTEM OR DESK BUTTON RELEASE AT RECEPTION. ALWAYS FREE EGRESS. FAIL SECURE.

Hardware Group No. CR714AM - PAIR EXTER PANIC (ALSF) (ACCESS CONTROLLED) 2-RX-QEL/99-VR/KR4954/DC
PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	PIVOT SET	7215 SET	626	IVE
2	EA	INTERMEDIATE PIVOT	7215 INT	626	IVE
2	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
2	EA	ELEC PANIC HARDWARE	RX-QEL-99-EO-CON 24 VDC	626	VON
1	EA	MULLION STORAGE KIT	MT54	689	VON
1	EA	FSIC RIM CYLINDER	20-057 ICX W/CONST. CORE	626	SCH
1	EA	FSIC MORTISE CYLINDER	20-061 ICX W/CONST. CORE	626	SCH
1	EA	FSIC PERMANENT CORE (EXT CORE)	20-740-XP VKC	626	SCH
1	EA	FSIC PERMANENT CORE	23-030 VKC	626	SCH
1	EA	DOOR PULL	VR910 DT (INACTIVE LEAF)	630	IVE
1	EA	DOOR PULL	VR910 NL	630	IVE
2	EA	SURFACE CLOSER	4040XP SCUSH SRI TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	MULLION SEAL	139N PSA HEIGHT AS REQ		ZER
1	EA	RAIN DRIP	142A DW + 4"	AA	ZER
	SET	SEAL	PERIMETER SEAL BY FRAME MANUFACTURER		
	SET	ASTRAGAL	MEETING STILE SEAL BY DOOR MFR		
2	EA	DOOR SWEEP	39A-DOOR WIDTH	A	ZER
1	EA	THRESHOLD	655A-EV3-226 FRAME WIDTH	A	ZER
2	EA	HARNESS (IN DOOR)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
2	EA	HARNESS (TO POWER SUPPLY)	CON-6W - CONNECTION LEADS		SCH
1	EA	MULTITECH READER	MT11/MT15 AS REQ (BY DIV 28 13 00)	BLK	SCE
1	EA	REMOTE RELEASE BUTTON	BY DIVISION 28 13 00	628	SCE
2	EA	DOOR CONTACT	679-05 AS REQ (BY DIVISION 28 13 00)	WHT	SCE
1	EA	POWER SUPPLY	PS904 BBK 900-4RL (BY DIVISION 28 13 00)	LGR	SCE

OPERATIONAL DESCRIPTION: ENTRANCE BY CREDENTIAL READER OR MANUAL KEY OVER-RIDE. ALWAYS FREE EGRESS. FAIL SECURE.

Hardware Group No. J002 - PAIR EXTERIOR GATE - PADLOCK
PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	PADLOCK (LFIC AS REQD)	KS41D1200 / KS43D3200 X 1-1/2" SHACKLE		SCH
1	EA	FSIC PERMANENT CORE (EXT CORE)	20-740-XP VKC	626	SCH
	EA	BALANCE HARDWARE	PROVIDED BY GATE SUPPLIER		B/O

Hardware Group No. J002SL - SLIDING EXTERIOR GATE - PADLOCK
PROVIDE EACH SL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	PADLOCK (LFIC AS REQD)	KS41D1200 / KS43D3200 X 1-1/2" SHACKLE		SCH
1	EA	FSIC PERMANENT CORE (EXT CORE)	20-740-XP VKC	626	SCH
	EA	BALANCE HARDWARE	PROVIDED BY GATE SUPPLIER		B/O

Hardware Group No. J704 - PAIR EXTERIOR GATE WITH PANIC HARDWARE
PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
	SET	GATE HINGE/CLOSER	BY GATE MANUFACTURER		B/O
	EA	CENTER POST	BY GATE SUPPLIER		
1	EA	PANIC HARDWARE	LD-OUT-99-EO-WH	626	VON
1	EA	PANIC HARDWARE	LD-OUT-99-L-17-WH	626	VON
1	EA	FSIC RIM CYLINDER	20-057 ICX W/CONST. CORE	626	SCH
1	EA	FSIC PERMANENT CORE (EXT CORE)	20-740-XP VKC	626	SCH
	EA	BALANCE HARDWARE	PROVIDED BY GATE SUPPLIER		B/O

-COORDINATE ALL HARDWARE WITH THE GATE MFR. PRIOR TO SUBMITTALS
-ALL REMAINING HARDWARE BY GATE MFR. (HINGES, CLOSER, PLATES, ETC.)
-1EA 3/4″ MOUNTING PLATE FOR EXIT DEVICE
-PROVIDE PLATE OR MESH ON GATE TO PREVENT INDIVIDUALS FROM REACHING IN AND OPENING THE GATE FROM SECURE SIDE.
-EGRESS BY THE PUSH PADS.

Hardware Group No. J705 - SGL EXTERIOR GATE WITH PANIC HARDWARE
PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
	SET	GATE HINGE/CLOSER	BY GATE MANUFACTURER		B/O
1	EA	PANIC HARDWARE	LD-OUT-99-L-17-WH	626	VON
1	EA	FSIC RIM CYLINDER	20-057 ICX W/CONST. CORE	626	SCH
1	EA	FSIC PERMANENT CORE (EXT CORE)	20-740-XP VKC	626	SCH
	EA	BALANCE HARDWARE	PROVIDED BY GATE SUPPLIER		B/O

-COORDINATE ALL HARDWARE WITH THE GATE MFR. PRIOR TO SUBMITTALS
-ALL REMAINING HARDWARE BY GATE MFR. (HINGES, CLOSER, PLATES, ETC.)
-1EA 3/4″ MOUNTING PLATE FOR EXIT DEVICE
-PROVIDE PLATE OR MESH ON GATE TO PREVENT INDIVIDUALS FROM REACHING IN AND OPENING THE GATE FROM SECURE SIDE.
-EGRESS BY THE PUSH PADS.

Hardware Group No. S503 - SGL STC CLASSROOM LOCK
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	ND70TD SPA K510-066 BACKSET REQD	626	SCH
1	EA	FSIC PERMANENT CORE	23-030 VKC	626	SCH
1	EA	DOOR STOP	FS448/ WS401CCV AS REQ	626	IVE
1	EA	STRIKE & CLOSER MOUNTING BRACKETS	328SPB/870SPB/770SPB (AS REQD)		ZER
		NOTE	BALANCE OF HARDWARE PROVIDED BY STC DOOR MFR		

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 - SGL STC PANIC
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	626	VON
1	EA	FSIC RIM CYLINDER	20-057 ICX W/CONST. CORE	626	SCH
1	EA	FSIC PERMANENT CORE	23-030 VKC	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA TBSRT X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	DOOR STOP	FS448/ WS401CCV AS REQ	626	IVE
1	EA	STRIKE & CLOSER MOUNTING BRACKETS	328SPB/870SPB/770SPB (AS REQD)		ZER
	EA	BALANCE OF HARDWARE	PROVIDED BY SOUND DOOR MFG		B/O
		NOTE	BALANCE OF HARDWARE PROVIDED BY STC DOOR MFR		

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 8000
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Insulated glass units.

B. Glazing units.

C. Glazing compounds.

1.02 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Sealants for other than glazing purposes.

B. Section 08 1113 - Hollow Metal Doors and Frames: Glazed lites in doors and borrowed lites.

C. Section 08 1416 - Flush Wood Doors: Glazed lites in doors.

D. Section 08 4313 - Aluminum-Framed Storefronts: Glazing provided as part of storefront assembly.

E. Section 08 4413 - Glazed Aluminum Curtain Walls: Glazing provided as part of wall assembly.

F. Section 08 8300 - Mirrors.

G. Section 08 8723 - Security Films.

H. Section 08 8813 - Fire-Rated Glazing.

I. Section 08 8856-Security Glazing.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

D. ASTM C1036 - Standard Specification for Flat Glass; 2021.

E. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2019.

F. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

G. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2015.

H. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.

I. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2010.

J. FTD-SA - Filti Testing and Development Shooter Attack Certification.; Current Edition.

K. GANA (GM) - GANA Glazing Manual; 2022.

L. GANA (LGRM) - Laminated Glazing Reference Manual; 2009.

M. GANA (SM) - GANA Sealant Manual; 2008.

N. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use; 1990 (2016).

O. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2017.

P. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2014, with Errata (2017).

Q. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2017.

R. UL 972 - Standard for Burglary Resisting Glazing Material; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by each of the affected installers.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data on Insulating Glass Unit, Glazing Unit, and Plastic Film Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Samples: Submit two samples 4 by 6 inch in size of glass units.

E. Certificate: Certify that products of this section meet or exceed specified requirements.

F. Manufacturer's qualification statement.

G. Installer's qualification statement.

H. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with GANA (GM), GANA (SM), GANA (LGRM), and IGMA TM-3000 for glazing installation methods.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.
   1. Provide certified glass products through ANSI accredited certifications that include plant audits and independent laboratory performance testing.
      a. Insulating Glass Certification Council (IGCC).
      b. Safety Glazing Certification Council (SGCC).

C. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years documented experience and approved by manufacturer.

1.07 MOCK-UPS

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Provide on-site glazing mock-up with the specified glazing components.

C. Locate where directed.

D. Mock-ups may remain as part of the Work.

1.08 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 40 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Insulating Glass Units: Provide a ten (10) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

C. Laminated Glass: Provide a five (5) year manufacturer warranty to include coverage for delamination, including providing products to replace failed units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Glass Fabricators:
   1. Oldcastle BuildingEnvelope: www.obe.com.
   2. Viracon, Inc: www.viracon.com/#sle.
   3. Other Fabricators as approved by the Float Glass Manufacturer.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Float Glass Manufacturers:
   1. AGC Glass North America, Inc: www.agcglass.com/#sle.
   2. Guardian Glass, LLC: www.guardianglass.com/#sle.
   3. Pilkington North America Inc: www.pilkington.com/na/#sle.
   4. Saint Gobain North America: www.saint-gobain.com/#sle.
   5. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.
   6. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
   1. Design Pressure: Calculated in accordance with applicable codes.
   2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
   3. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
   4. Glass thicknesses listed are minimum. Deflection shall be no greater than the thickness of the glass. Final glazing thickness shall comply with all specification reference standards and glazing manufacturer recommendations for span width and height of each installation.

B. Weather-Resistive Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure water-resistive barrier, vapor retarder, and/or air barrier.

C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
   1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
   2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
   3. Solar Optical Properties: Comply with NFRC 300 test method.

D. Fully Tempered Safety Glass: Shall meet impact resistance per ANSI Z97.1 - Class A, or 16 CFR 1201 - Category II criteria for safety glazing used in hazardous locations.

2.03 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless otherwise indicated.
   1. Fully Tempered Safety Glass: Shall meet impact resistance per ANSI Z97.1 - Class A, or 16 CFR 1201 - Category II criteria for safety glazing used in hazardous locations.
   2. Tinted Type: ASTM C1036, Class 2 - Tinted, Quality - Q3, with color and performance characteristics as indicated.

3. Thicknesses: Glass thicknesses listed are minimum. Deflection shall be no greater than the thickness of the glass. Final glazing thickness shall comply with all specification reference standards and glazing manufacturer recommendations for span width and height of each installation.

B. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
   1. Laminated Safety Glass: Complies with ANSI Z97.1 - Class A or 16 CFR 1201 - Category II impact test requirements.
   2. Polyvinyl Butyral (PVB) Interlayer: 0.030 inch thick, minimum.

2.04 INSULATED GLASS UNITS

A. Manufacturers:
   1. Glass: Any of the manufacturers specified for float glass, unless specifically required by manufacturer's tested assembly.

B. Fabricator: Certified by glass manufacturer for type of glass, coating, and treatment involved and capable of providing specified warranty.

C. Insulated Glass Unit Construction: Types as indicated.
   1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
   2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
   3. Metal-Edge Spacers: Aluminum, bent and soldered corners.
      a. Spacer Color: Aluminum.
   4. Warm Edge or Thermoplastic Spacers may be used at contractor’s option.
      a. Spacer Color: Black or Gray.
   5. Spacer Color: Aluminum.
   6. Edge Seal:
      a. Dual-Sealed System: Provide polyisobutylene sealant (or thermoplastic in TPS system) as primary seal applied between spacer and glass panes, and silicone sealant as secondary seal applied around perimeter.
      b. Color: Black.
   7. Space between lites filled with air.
   8. Purge interpane space with dry air, hermetically sealed.
   9. Capillary Tubes: Provide tubes from air space for insulating glass units without inert type gas that have a change of altitude greater than 2500 feet between point of fabrication and point of installation to permit pressure equalization of air space.
      a. Capillary Tubes: Tubes to remain open and be of length and material type in accordance with insulating glass fabricator's requirements.

D. Type IGU - Insulated Glass Units:
   1. Applications: Exterior glazing unless otherwise indicated.
   2. Outboard Lite: Heat-strengthened unless fully tempered is required by code, 1/4 inch thick, minimum.
      a. Tint: Basis of Design, Atlantica by Vitro.
   3. Inboard Lite: Heat-strengthened unless fully tempered is required by code float glass, 1/4 inch thick, minimum.
      a. Tint: Clear.
      b. Coating: Basis of Design, Solarban 70 by Vitro, on #3 surface.
   4. Total Thickness: 1 inch.
   5. Thermal Transmittance (U-Value), Summer - Center of Glass: 0.28, maximum.
   6. Visible Light Transmittance (VLT): 48 percent, minimum.
   7. Solar Heat Gain Coefficient (SHGC): 0.28, maximum.
   8. Visible Light Reflectance, Outside: 9 percent, maximum.

9. Glazing Method: Dry glazing method, gasket glazing.

E. Type IGSEF - Insulated Glass with applied SEcurity Film
   1. Applications: Where indicated on the drawings.
   2. Outboard Lite: Heat-strengthened unless fully tempered is required by code float glass, 1/4 inch thick, minimum.
      a. Tint: Basis of Design, Atlantica by Vitro.
   3. Inboard Lite: Heat-strengthened unless fully tempered is required by code, 1/4 inch thick, minimum.
      a. Tint: Clear.
      b. Coating: Basis of Design, Solarban 70 by Vitro, on #3 surface.
      c. Provide Security Film as specified in 08 8723-Security Films.
      d. Apply Security Film on #4 surface.
   4. Total Thickness: 1 inch.
   5. Thermal Transmittance (U-Value), Summer - Center of Glass: 0.28, maximum.
   6. Visible Light Transmittance (VLT): 48 percent, minimum.
   7. Solar Heat Gain Coefficient (SHGC): 0.28, maximum.
   8. Visible Light Reflectance, Outside: 9 percent, maximum.
   9. Forced Entry Resistance; Must comply with one of the following multiple impact test:
      a. FTD-SA - Filti Testing and Development Shooter Attack Certification Class 1.
      b. UL 972 tests in compliance with level of burglary and forced-entry resistance indicated; Multiple Impact.
   10. Wet Glaze Anchoring System: Structural Silicone Sealant/Adhesive.
      a. Dow Chemical Company; Dowsil 995 Silicone Structural Sealant: www.dow.com.

F. Type IGS - Insulated Glass Spandrel:
   1. Applications: Exterior spandrel glazing unless otherwise indicated.
   2. Outboard Lite: Heat-strengthened unless fully tempered is required by code float glass, 1/4 inch thick, minimum.
      a. Tint: Same as Type IGU.
   3. Inboard Lite: Heat-strengthened unless fully tempered is required by code float glass, 1/4 inch thick.
      a. Tint: Clear.
      b. Opacifier: Ceramic frit, on #4 surface.
      c. Opacifier Color: Match Type IGU.
      d. Coating: Same as Type IGU, on #3 surface.
   4. Total Thickness: 1 inch.
   5. Glazing Method: Dry glazing method, gasket glazing.

2.05 GLAZING UNITS

A. Type GTC - Glass Tempered Clear:
   1. Applications: Interior glazing unless otherwise indicated.
   2. Glass Type: Fully tempered float glass.
   3. Tint: Clear.
   4. Thickness: 1/4 inch, minimum.

B. Type GLSA - Glass Laminated SAfety:
   1. Applications: Locations as indicated on drawings.
   2. Tint: Clear.
   3. Thickness: 1/2 inch, nominal.
      a. Outer Lite: Fully Tempered glass.
      b. Interlayer: Polyvinyl butyral (PVB), thickness as required to meet performance criteria.
      c. Inside Lite: Tempered glass.

C. Type GSEF - Glass with applied SEcurity Film:
   1. Applications: Locations as indicated on drawings..
   2. Glass Type: Fully tempered float glass.
   3. Tint: Clear.
   4. Thickness: 1/4 inch, minimum.
   5. Provide Security Film as specified in 08 8723-Security Films.
   6. Apply Security Film to secure side of glass.
   7. Forced Entry Resistance; Must comply with one of the following multiple impact test:
      a. FTD-SA - Filti Testing and Development Shooter Attack Certification Class 1.
      b. UL 972 tests in compliance with level of burglary and forced-entry resistance indicated; Multiple Impact.
   8. Wet Glaze Anchoring System: Structural Silicone Sealant/Adhesive.
      a. Dow Chemical Company; Dowsil 995 Silicone Structural Sealant: www.dow.com.

2.06 GLAZING COMPOUNDS

A. Butyl Sealant: Single component; ASTM C920 Grade NS, Class 12-1/2, Uses M and A, Shore A hardness of 10 to 20; black color.

B. Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; nonbleeding, nonstaining; ASTM C920 Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; color as selected.

C. Silicone Structural Sealant: Single component; neutral curing; designed specifically for structural bonding applications of glass; color as selected.
   1. Basis of Design: Dow Chemical Company; Dowsil 995 Silicone Structural Sealant: www.dow.com.

2.07 ACCESSORIES

A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness. Minimum 3 inch long by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.

C. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.

D. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; color black.

E. Glazing Clips: Manufacturer's standard type.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that the minimum required face and edge clearances are being provided.

C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

D. Verify that sealing between joints of glass framing members has been completed effectively.

E. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.

B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.

D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.

E. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

F. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, and paint.

3.04 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.

B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.05 CLEANING

A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

B. Remove nonpermanent labels immediately after glazing installation is complete.

C. Clean glass and adjacent surfaces after sealants are fully cured.

D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.06 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

SECTION 08 8300
MIRRORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Unframed Mirrors.
   1. Annealed float glass.

1.02 RELATED REQUIREMENTS

A. Section 10 2800 - Toilet, Bath, and Laundry Accessories: Framed mirrors at restrooms.

1.03 REFERENCE STANDARDS

A. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

B. ASTM C1036 - Standard Specification for Flat Glass; 2021.

C. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

D. GANA (GM) - GANA Glazing Manual; 2022.

E. GANA (SM) - GANA Sealant Manual; 2008.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data on Mirror Types: Submit structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds: Submit chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Samples: Submit two samples, 4 x 6 inch in size, illustrating mirrors design, edging, and coloration.

E. Manufacturer's Certificate: Certify that mirrors, meets or exceeds specified requirements.

F. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with GANA (GM) and GANA (SM) for glazing installation methods.

B. Fabricate, store, transport, receive, install, and clean mirrors in accordance with manufacturer's recommendations.

1.06 FIELD CONDITIONS

A. Do not install mirrors when ambient temperature is less than 50 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for reflective coating on mirrors and replacement of same.

PART 2 PRODUCTS

2.01 MATERIALS

A. Mirror Design Criteria: Select materials and/or provide supports as required to limit mirror material deflection to 1/200, or to the flexure limit of glass, with full recovery of glazing materials, whichever is less.

B. Mirror Glass; Type MIR: Clear, annealed float glass; ASTM C1036, with copper and silver coatings, and protective overcoating.
   1. Applications: Provide and install mirrors on wall where noted on drawings as Unframed Mirror.
   2. Mirrors shall be installed with Category II Safety Backing to comply with ANSIZ97.1 and 16CFR1201 for impact resistance.
   3. Thickness: 1/4 inch.
   4. Edges: Ground.
   5. Size: As indicated on drawings.

2.02 GLAZING COMPOUNDS

A. Silicone Sealant: ASTM C920, Type S, Grade NS, Class 25, Uses M and A; single component; chemical or solvent curing; non-bleeding, non-staining, cured Shore A hardness of 15 to 25; color as selected.

2.03 ACCESSORIES

A. Glazing Tape: Preformed butyl compound; 10 to 15 Shore A durometer hardness; on release paper.

B. Glazing Clips: Manufacturer's standard type.

C. Mirror Attachment Accessories: Stainless steel clips.

D. Mirror Adhesive: Silicone pre-polymer based, chemically compatible with mirror coating and wall substrate.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that openings for mirrored glazing are correctly sized and within tolerance.

B. Verify that surfaces of mirror frames or recesses are clean, free of obstructions, and ready for installation of mirrors.

3.02 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

B. Seal porous mirror frames or recesses with substrate compatible primer or sealer. Prime surfaces scheduled to receive sealant.

C. Prepare installation in accordance with ASTM C1193 for solvent release sealants, and install sealant in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. Install mirrors in accordance with manufacturer's recommendations.

B. Set mirrors plumb and level, and free of optical distortion.

C. Set mirrors with edge clearance free of surrounding construction including countertops or backsplashes.

D. Frameless Mirrors: Set mirrors with clips, and anchor rigidly to wall construction.

3.04 CLEANING

A. Remove wet glazing materials from finish surfaces.

B. Remove labels after work is complete.

C. Clean mirrors and adjacent surfaces.

END OF SECTION

SECTION 08 8723
SECURITY FILMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glazing film applied to new glazing assemblies.

B. All film and anchoring shall be field installed by qualified and certified applicators.

1.02 RELATED REQUIREMENTS

A. Section 08 1113 - Hollow Metal Doors and Frames: New doors with glazing to receive film.

B. Section 08 4313-Aluminimum-Framed Storefronts: New glazing to receive film.

C. Section 08 4413 - Glazed Aluminum Curtain Walls: New glazing to receive film.

D. Section 08 8000 - Glazing: New glazing to received film.

1.03 REFERENCE STANDARDS

A. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

B. ASTM C1184 - Standard Specification for Structural Silicone Sealants; 2014.

C. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting; 2012.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Record of product certification for safety requirements.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Installation methods.

C. Shop Drawings: Detailing installation of film, anchoring accessories, and sealant.

D. Samples: For each film product to be used, minimum size 4 inches by 6 inches, representing actual product, color, and patterns.

E. Samples, Supplemental Anchors: Where supplemental anchors are necessary to achieve specified performance submit detailed information in accordance with substitution procedures; include two samples, minimum length 2 inches.

F. Test Reports: Detailed reports of full-scale chamber tests to specified criteria, using assemblies identical to those required for this project.

G. Specimen Warranty.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Glazing film manufacturer specializing in manufacture of safety glazing films with minimum 10 years successful experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of authorities having jurisdiction.

1.07 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide 10 year manufacturer's replacement warranty to cover film against peeling, cracking, discoloration, and deterioration.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. 3M Window Film: www.solutions.3m.com.

B. Armor Glass Security Films: www.armorglass.com.

C. Saint Gobain; Solar Gard Armorcoat: www.solargard.com.

D. Substitutions: See Section 01 6000 - Product Requirements.

2.02 SECURITY FILM

A. Security Film: Transparent polyester security film for permanent bonding to glass.
   1. Thickness: 0.014 inch, minimum.
   2. Color: Clear.
   3. Construction: Multi-ply laminate.
   4. Adhesive Type: Pressure sensitive acrylic.
   5. Tensile Strength: 25,000 psi minimum when tested in accordance with ASTM D882.
   6. Breaking Strength: 350 psi when tested in accordance with ASTM D882.
   7. Surface Burning Characteristics: Flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84 (Class A).
   8. Anchoring System: Provide silicone structural sealant attachment system installed per manufacturers recommendations.

B. Accessory Materials: As recommended or required by film manufacturer.

C. Supplementary Anchors: As required by performance criteria and acceptable to Architect.

D. Silicone Structural Sealant: Self-priming, elastomeric adhesive complying with ASTM C1184.
   1. Silicone Structural Sealant: Single component; neutral curing; designed specifically for structural bonding applications of glass; ASTM C920 Type S, Grade NS, Class 50, Uses NT, A, and G; with cured Shore A hardness of 40; color as selected.
   2. Basis of Design: Dow Chemical Company; Dowsil 995 Silicone Structural Sealant: www.dow.com.

E. Glass Cleaner: As recommended by glazing film manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Field -Applied Film: Verify that existing conditions are adequate for proper application and performance of film.

B. Examine glass and frames. Verify that existing conditions are adequate for proper application and performance of film.

C. Verify glass is not cracked, chipped, broken, or damaged.

D. Verify that frames are securely anchored and free of defects.

E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean glass of dust, dirt, paint, oil, grease, mildew, mold, and other contaminants that would inhibit adhesion.

B. Immediately prior to applying film, thoroughly wash glass with neutral cleaning solution.

C. Protect adjacent surfaces.

D. Do not begin installation until substrates have been properly prepared.

3.03 INSTALLATION

A. Do not apply glazing film when surface temperature is less that 40 degrees F or if precipitation is imminent.

B. Install in accordance with manufacturer's instructions, without air bubbles, wrinkles, streaks, bands, thin spots, pinholes, or gaps, as required to achieve specified performance.

C. Seams: Seam film only as required to accommodate material sizes; form seams vertically without overlaps and gaps; do not install with horizontal seams.

D. Structural Sealant and Supplemental Anchors: Install in accordance with manufacturer's instructions and shop drawings.

E. Clean glass and anchoring accessories following installation. Remove excess sealants and other glazing materials from adjacent finished surfaces.

F. Remove labels and protective covers.

3.04 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 08 8813
FIRE-RATED GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire-rated glazing units.

B. Glazing compounds.

1.02 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Sealants for other than glazing purposes.

B. Section 08 1213 - Hollow Metal Frames: Glazed borrowed lites.

C. Section 08 1416 - Flush Wood Doors: Glazed lites in doors.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2015).

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

E. GANA (GM) - GANA Glazing Manual; 2022.

F. GANA (LGRM) - Laminated Glazing Reference Manual; 2009.

G. GANA (SM) - GANA Sealant Manual; 2008.

H. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use; 1990 (2016).

J. ITS (DIR) - Directory of Listed Products; current edition.

K. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2017.

L. NFPA 257 - Standard on Fire Test for Window and Glass Block Assemblies; 2017.

M. UL (DIR) - Online Certifications Directory; Current Edition.

N. UL 9 - Standard for Fire Tests of Window Assemblies; Current Edition, Including All Revisions.

O. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

P. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene preinstallation meeting one week before starting work of this section; require attendance by each of affected installers.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data on Glazing Unit Glazing Types: Provide structural, physical, and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Samples: Two samples 4 by 6 inch in size of glass units.

E. Certificate: Certify that products of this section meet or exceed specified requirements.

F. Manufacturer's qualification statement.

G. Installer's qualification statement.

H. Specimen warranty.

1.06 QUALITY ASSURANCE

A. Perform work in accordance with GANA (GM), GANA (SM), GANA (LGRM), and IGMA TM-3000 for glazing installation methods.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
   1. Provide certified glass products through ANSI accredited certifications that include plant audits and independent laboratory performance testing.
      a. Insulating Glass Certification Council (IGCC).
      b. Safety Glazing Certification Council (SGCC).

C. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.07 MOCK-UPS

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Provide on-site glazing mock-up with specified glazing components.

C. Locate where directed.

D. Mock-ups may remain as part of work.

1.08 FIELD CONDITIONS

A. Ambient Conditions: Do not install glazing when ambient temperature is less than 40 degrees F.

B. Maintain minimum ambient temperature before, during, and 24 hours after installation of glazing compounds.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a one year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire-Protection-Rated Glass:
   1. Fabricators:
      a. GGI - General Glass International: www.generalglass.com/#sle.
      b. McGrory Glass, Inc: www.mcgrory.com/glass/fire-rated-glass-schott-pyran-platinum/#sle.
   2. Manufacturers:
      a. McGrory Glass, Inc: www.mcgrory.com/fire-rated-glass/#sle.
      b. SAFTIFIRST, a division of O'Keeffe's Inc: www.safti.com/#sle.
      c. SCHOTT North America Inc: www.us.schott.com/#sle.
      d. Technical Glass Products: www.fireglass.com/#sle.
      e. Vetrotech North America: www.vetrotechusa.com/#sle.
      f. Substitutions: See Section 01 6000 - Product Requirements.

2.02 GLAZING UNITS

A. Type GFPR - Glass Fire-Protection-Rated: Type, thickness, and configuration of glazing that contains flame, smoke, and does not block radiant heat, as required to achieve indicated fire rating period as indicated on drawings.
   1. Applications:
      a. Glazing in fire-protection-rated door assembly.
      b. Glazing in fire-protection-rated window assembly.
      c. Other locations as indicated on drawings.
   2. Provide products listed by ITS (DIR) or UL (DIR) and approved by authorities having jurisdiction.
   3. Safety Glazing Certification: 16 CFR 1201 Category II.
   4. Glazing Method: As required for fire rating.
   5. Fire-Rating Period: As indicated on drawings.
   6. Markings for Fire-Protection-Rated Glazing Assemblies: Provide permanent markings on fire-protection-rated glazing in compliance with ICC (IBC), local building code, and authorities having jurisdiction
      a. "D" - meets fire door assembly criteria of NFPA 252, UL 10B, or UL 10C fire test standards.
      b. "OH" - meets fire window assembly criteria, including hose stream test of NFPA 257 or UL 9 fire test standards.
      c. "H" - meets fire door assembly hose stream test of NFPA 252, UL 10B, or UL 10C fire tests standards.
      d. "XXX" - placeholder that represents fire-rating period, in minutes.

2.03 GLAZING COMPOUNDS

A. Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; nonbleeding, nonstaining; ASTM C920 Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; color as selected.

2.04 ACCESSORIES

A. Setting Blocks: Neoprene, EPDM, or silicone, with 70 to 90 Shore A durometer hardness. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Continuous by one half the height of glazing stop by thickness to suit application, self adhesive on one face.

C. Glazing Tape: Closed-cell polyvinyl chloride (PVC) foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume of 2 percent, designed for compression of 25 percent to affect air barrier and vapor retarder seal.

D. Glazing Gaskets: Flexible intumescent seals.
   1. Material: Co-extruded intercalated graphite combined with thermoplastic lip.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that minimum required face and edge clearances are provided.

C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

D. Verify that sealing between joints of glass framing members has been completed effectively.

E. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION - GENERAL

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers unless more stringent requirements are indicated, including those in referenced glazing standards.

B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.

D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.

E. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

F. Prevent glass from contact with contaminating substances that may result from construction operations including, but not limited to weld spatter, fire-safing, plastering, mortar droppings, etc.

3.04 CLEANING

A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.

B. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

C. Remove nonpermanent labels immediately after glazing installation is complete.

D. Clean glass and adjacent surfaces after sealants are fully cured.

E. Clean glass on both exposed surfaces not more than four days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.05 PROTECTION

A. After installation, mark pane with 'X' by using removable plastic tape or paste; do not mark heat-absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

SECTION 08 9100
LOUVERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Louvers, frames, and accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.

B. Division 23 - HVAC: Ductwork attachment to louvers.

1.03 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

B. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; 2015.

C. AMCA 511 - Certified Ratings Program for Air Control Devices; 2010.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data describing design characteristics, maximum recommended air velocity, design free area, materials and finishes.

C. Shop Drawings: Indicate louver layout plan and elevations, opening and clearance dimensions, tolerances; head, jamb and sill details; blade configuration, screens, blankout areas required, and frames.

D. Samples: Submit two samples 12 by 12 inches in size illustrating finish and color of exterior and interior surfaces.

E. Test Reports: Independent agency reports showing compliance with specified performance criteria.

F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

G. Maintenance Data: Include lubrication schedules, adjustment requirements.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum five years of documented experience.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide one year manufacturer's warranty against distortion, metal degradation, and connection failures of louver components.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Louvers:
   1. Airolite Company, LLC: www.airolite.com.
   2. American Warming and Ventilating: www.awv.com.
   3. Construction Specialties, Inc: www.c-sgroup.com.
   4. Ruskin Manufacturing; www.ruskin.com.
   5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 LOUVERS

A. Louvers: Factory fabricated and assembled, complete with frame, mullions, and accessories; AMCA Certified in accordance with AMCA 511.
   1. Wind Load Resistance: Design to resist positive and negative wind load as required by code without damage or permanent deformation.
   2. Intake Louvers: Design to allow maximum of 0.01 oz/sq ft water penetration at calculated intake design velocity based on design air flow and actual free area, when tested in accordance with AMCA 500-L.
   3. Drainable Blades: Continuous rain stop at front or rear of blade aligned with vertical gutter recessed into both jambs of frame.

B. Wind Driven Rain Resistant LouversLouvers: Horizontal blade, extruded aluminum construction.
   1. Free Area: 44 percent, minimum.
   2. Pressure Drop: ____ inches of water gauge maximum per square foot of free area at velocity of ____ fpm, when tested in accordance with AMCA 500-L, test unit size 48 inch by 48 inch.
   3. Blades: Sightproof with drainable edge design.
   4. Frame: 5 inches deep, channel profile; corner joints mitered and , with continuous recessed caulking channel each side.
   5. Aluminum Thickness: Frame 12 gage, 0.0808 inch minimum; blades 12 gage, 0.0808 inch minimum.
   6. Aluminum Finish: Superior performing organic coatings.
   7. Product: Use the following or any equivalent made by one of the listed manufacturers: Model EME520DD - Ruskin Company.

2.03 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

2.04 FINISHES

A. Superior Performing Organic Coatings: AAMA 2605 multiple coat, thermally cured polyvinylidene fluoride system.
   1. Polyvinylidene fluoride (PVDF) multi-coat thermoplastic fluoropolymer coating system, including minimum 70 percent PVDF color topcoat and minimum total dry film thickness of 0.9 mil; color and gloss as scheduled.

B. Color: See Section 01 6210 - Schedule of Materials and Colors.

2.05 ACCESSORIES

A. Blank-Off Panels: Same material as louver, painted black on exterior side; provide where duct connected to louver is smaller than louver frame, sealing off louver area outside duct.

B. Fasteners and Anchors: Stainless steel.

C. Flashings: Of same material as louver frame, formed to required shape, single length in one piece per location.

D. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared openings and flashings are ready to receive this work and opening dimensions are as indicated on shop drawings.

B. Verify that field measurements are as indicated on shop drawings.

3.02 INSTALLATION

A. Install louver assembly in accordance with manufacturer's instructions.

B. Install louvers level and plumb.

C. Set sill members and sill flashing in continuous bead of sealant.

D. Install flashings and align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.

E. Secure louver frames in openings with concealed fasteners.

F. Coordinate with installation of mechanical ductwork.

G. Coordinate with installation of louver actuators.

3.03 ADJUSTING

A. Adjust operable louvers for freedom of movement of control mechanism. Lubricate operating joints.

3.04 CLEANING

A. Strip protective finish coverings.

B. Clean surfaces and components.

END OF SECTION

SECTION 09 2116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Exterior gypsum sheathing.

C. Gypsum wallboard.

D. Joint treatment and accessories.

E. Textured finish system.

1.02 RELATED REQUIREMENTS

A. Section 05 4000 - Cold-Formed Metal Framing: Structural steel stud framing.

B. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.

C. Section 07 2100 - Thermal Insulation: Acoustic insulation.

D. Section 07 2700-Air and Water Barriers: Air and water-resistive barrier over sheathing.

E. Section 07 8400 - Firestopping: Top-of-wall assemblies at fire-resistance-rated walls.

F. Section 07 9200 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

1.03 REFERENCE STANDARDS

A. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017.

B. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.

C. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2020.

D. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2022.

E. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2018.

F. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2020.

G. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base; 2019.

H. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2017.

I. ASTM C1178/C1178M - Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel; 2018.

J. ASTM C1280 - Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing; 2018.

K. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

L. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2016.

M. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

N. ASTM E413 - Classification for Rating Sound Insulation; 2016.

O. GA-214 - Levels of Finish for Gypsum Panel Products; 2021.

P. GA-216 - Application and Finishing of Gypsum Panel Products; 2016.

Q. GA-226 - Application of Gypsum Board to Form Curved Surfaces; 2025.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.

C. Product Data: Provide data on gypsum board, glass mat faced gypsum board, accessories, and joint finishing system.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum five years of experience.

B. Product Qualifications:
   1. Single Source Responsibility:
      a. Obtain gypsum board products, joint treatment products, and textured coatings from a single manufacturer.

C. Mock-ups
   1. At an area on the site where approved by the Architect, provide a mock-up gypsum wallboard panel.
      a. Make the panel approximately 4'-0" square.
      b. Provide one mock-up panel for each gypsum wallboard finish used on the Work.
      c. For exterior gypsum sheathing, panel shall be complete with all joint sealant, wall ties and/or connectors, flashings and face veneer.
      d. The mock-ups may be used as part of the Work, and may be included in the finished Work, when so approved by the Architect.
      e. Revise as necessary to secure the Architect's approval.
   2. The mock-up panels, when approved by the Architect, will be used as datum points for comparison with the remainder of the work of this Section for the purpose of acceptance or rejection.

D. Reference Standards:
   1. Install gypsum board in accordance with applicable requirements and recommendations of Gypsum Association GA 216, "Recommended Specifications for the Application and Finishing of Gypsum Board", except for more stringent requirements of manufacturer.
   2. Apply acoustical sealant in accordance with applicable requirements of ASTM C919.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Section 01 6000 – Product Requirements.

B. Acceptance at Site
   1. Deliver material to site promptly without undue exposure to weather.
   2. Deliver in manufacturer's unopened containers or bundles, fully identified with name, brand, type and grade.

C. Storage and Protection
   1. Protect materials from contamination, dampness, freezing, or overheating in accordance with manufacturer's instructions.
   2. Store above ground in dry, ventilated space.
   3. Broken, or damaged gypsum board will be rejected, whether built-in or not.

1.07 PROJECT CONDITIONS

A. Project Environmental Requirements

1. Comply with requirements of referenced standards and recommendations of material manufacturers for environmental conditions before, during, and after installation.
2. Do not begin installation of gypsum board until building is completely enclosed and protected from water infiltration.
3. Do not install gypsum board when ambient temperature is below 40ºF.
4. For adhesive attachment of gypsum board, and for finishing of gypsum board, maintain ambient temperature above 55ºF from one week prior to attachment or joint treatment, and until joint treatment is complete and dry.
5. Maintain illumination as required for proper installation of material.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.
   1. See PART 3 for finishing requirements.

B. Interior Partitions: Provide completed assemblies with the following characteristics:
   1. Acoustic Attenuation: STC of 45-49 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

C. Fire-Resistance-Rated Assemblies: Provide completed assemblies complying with applicable code.

2.02 METAL FRAMING MATERIALS

A. Structural and Non-Structural Steel Framing for Application of Gypsum Board: As specified in Section 05 4000.

2.03 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
   1. CertainTeed Corporation: www.certainteed.com/#sle.
   2. Georgia-Pacific Gypsum: www.gpgypsum.com/#sle.
   3. National Gypsum Company: www.nationalgypsum.com/#sle.
   4. USG Corporation: www.usg.com/#sle.
   5. Substitutions: See Section 01 6000 - Product Requirements.

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application:
      a. Non-fire rated partitions and ceilings: Type X.
      b. Fire rated partitions: Type X.
      c. Fire rated ceilings: Type C.
   2. Thickness:
      a. Vertical Surfaces: 5/8 inch.
      b. Ceilings: 5/8 inch.
      c. Multi-Layer Assemblies: Minimum 2 layers of 1/4" for curved walls or thickness as indicated on drawings.
         1) Minimum radius 10".
   3. Paper-Faced Products:
      a. CertainTeed Corporation; Type X and C Drywall: www.certainteed.com/#sle.
      b. Georgia-Pacific Gypsum; ToughRock Fireguard X and C: www.gpgypsum.com/#sle.
      c. National Gypsum Company; Gold Bond BRAND Fire-Shield Type X and C Gypsum Board: www.nationalgypsum.com/#sle.
      d. USG Corporation; USG Sheetrock Brand Firecode X and C Panels: www.usg.com/#sle.
      e. Substitutions: See Section 01 6000 - Product Requirements.
   4. Flexible Gypsum Panels:

a. National Gypsum Company; Gold Bond High Flex Gypsum Board: www.nationalgypsum.com/#sle.
b. Substitutions: See Section01 6000-Product Requirements.

C. Backing Board For Wet Areas:
1. Application: Surfaces behind tile and in wet areas including tub and shower surrounds, shower ceilings, and typical wall drywall base as detailed on the drawings.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
3. Glass Mat Faced Board: Coated glass mat water-resistant gypsum backing panel as defined in ASTM C1178/C1178M.
a. Fire-Resistance-Rated Type: Type X core, thickness 5/8 inch.
b. Products:
1) CertainTeed Corporation; GlasRoc 5/8" Type X Tile Backer: www.certainteed.com/#sle.
2) Georgia-Pacific Gypsum; DensShield Tile Backer: www.gpgypsum.com/#sle.
3) National Gypsum Company; Gold Bond eXP Tile Backer: www.nationalgypsum.com/#sle.
4) Substitutions: See Section 01 6000 - Product Requirements.

D. Exterior Sheathing Board: Sizes to minimize joints in place; ends square cut.
1. Application: Exterior sheathing, unless otherwise indicated.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
3. Glass Mat Faced Sheathing: Glass mat faced gypsum substrate as defined in ASTM C1177/C1177M.
4. Core Type: Type X, as indicated.
5. Type X Thickness: 5/8 inch.
6. Edges: Square.
7. Glass Mat Faced Products:
a. CertainTeed Corporation; GlasRoc Type X Exterior Sheathing: www.certainteed.com/#sle.
b. Georgia-Pacific Gypsum; DensGlass Fireguard Sheathing: www.gpgypsum.com/#sle.
c. National Gypsum Company; Gold Bond eXP Sheathing: www.nationalgypsum.com/#sle.
d. USG Corporation; USG Securock Brand Ultralight Glass-Mat Sheathing Firecode X: www.usg.com/#sle.
e. Substitutions: See Section 01 6000 - Product Requirements.

2.04 GYPSUM WALLBOARD ACCESSORIES

A. Acoustic Insulation: As specified in Section 07 2100.

B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

C. Water-Resistive Barrier: As specified in Section 07 2500.

D. Beads, Joint Accessories, and Other Trim: ASTM C1047, galvanized steel or rolled zinc, unless noted otherwise.
1. Corner Beads: Low profile, for 90 degree outside corners.
2. Splayed Corner Beads: All other than 90 degree outside corner.
3. Architectural Reveal Beads:
a. Shapes: As indicated on drawings.
4. Expansion Joints:
a. Type: V-shaped metal with factory-installed protective tape.

5. Adjustable Partition Closure between storefront and drywall: Gordon Interior Specialties; Mullion Mate. Provide insulation and gaskets. Size to match application. Finish to match storefront.
6. Other trims and reveals where shown on the drawings.

E. Moisture Guard Trim: ASTM C1047, rigid plastic, 48 inch length, applied to bottom edge of gypsum board.
1. Provide 1/2”Tall Extruded PVC Moisture Guard: installed continuously at floor level of all gypsum drywall throughout building.
2. On all 2-Hour Rated walls and once the wall assembly is constructed, place a bead of sealant (latex, acrylic, silicone, polymer, or similar materials – not necessarily listed “fire caulk”) at floor level against the outer most layer of moisture guard on each side of the wall.
3. Height: 1/2 inch.
4. Depth: 5/8 inch.
5. Products:
   a. Waterguard USA; Waterguard: www.waterguard-usa.com/#sle.
   b. Substitutions: See Section 01 6000 - Product Requirements.

F. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
1. Fiberglass Tape: 2 inch wide, coated glass fiber tape for joints and corners at glass mat faced board assemblies.
2. Paper Tape: 2 inch wide, creased paper tape for joints and corners, except as otherwise indicated.
3. Joint Compound: Drying type, ready-mixed.

G. Finishing Compound: Surface coat and primer, takes the place of skim coating.

H. Textured Finish Materials: Latex- or Vinyl-based compound; plain.

I. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

J. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion-resistant.

K. For exterior applications provide bugle or wafer head, rust-resistant sharp point, fine thread for light-gauge metal framing or furring.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C754 and as specified in Section 05 4000-Cold-Formed Metal Framing.

B. Blocking: Install supplementary framing, blocking and bracing for support of:
1. Framed openings.
2. Wall-mounted cabinets.
3. Plumbing fixtures.
4. Toilet partitions.
5. Toilet accessories.
6. Wall-mounted door hardware.
7. Heavy trim, furnishings or similar construction.

3.03 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Acoustic Sealant: Install in accordance with manufacturer's instructions.
   1. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.

3.04 BOARD INSTALLATION - GENERAL

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Wall Tile shall be installed on Concrete Unit Masonry or Glass Mat Faced Tile Backer Board in toilet/shower rooms, around water fountains or other areas in which the tile might be exposed to moisture. If CMU is not provided in these areas, Glass Mat Faced Tile Backer Board shall be used. Wall tile to be installed on Glass Mat Faced Tile Backer Board where located in corridors.

C. FRP shall be installed on Glass Mat Faced Tile Backer Board in toilet rooms, janitor closets, around water fountains or other areas in which the tile might be exposed to moisture.

D. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

E. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with water-resistant sealant.

F. Exterior Sheathing: Comply with GA-253 and ASTM C1280. Install sheathing vertically, with edges butted tight and ends occurring over firm bearing.
   1. Seal joints, cut edges, and holes with water-resistant sealant.
   2. Attach exterior sheathing to metal framing with screws spaced 8" o.c. at perimeter where there are framing supports; and 8" o.c. along intermediate framing in field. Do not counter sink.
   3. Locate fasteners minimum 3/8" from edges and ends of sheathing panels, tight against and flush with surface of sheathing.
   4. Immediately after installation, protect from weather by application of water-resistive barrier.

G. Installation on Metal Framing: Use screws for attachment of gypsum board.

H. Curved Surfaces: Apply gypsum board to curved substrates in accordance with GA-226.

3.05 BOARD INSTALLATION

A. Single Layer Gypsum Board on Metal Studs .
   1. Loosely butt gypsum board joints together and neatly fit.
   2. Do not place butt ends against tapered edges.
   3. Maximum allowable gap at end joints: 1/8 inch.
   4. Stagger joints on opposite sides of partitions.
   5. Apply ceiling boards first where gypsum board ceilings and wall occur.
   6. Cut openings in gypsum board to fit electrical outlets, plumbing, light fixtures and piping snugly and small enough to be covered by plates and escutcheons. Cut both face and back paper.
   7. Screw board in place securely with screws spaced according to manufacturer's recommendations.
   8. At internal and external corners, conceal the cut edges of the boards by the overlapping covered edges of the abutting boards.
   9. Stagger the boards so that corners of any four boards will not meet at a common point except in vertical corners.

10. At internal and external corners, conceal the cut edges of the boards by the overlapping covered edges of the abutting boards.
11. In all installations, gypsum wallboard shall be held above the finished floor a minimum of ½". Failure to comply with this requirement will be grounds for rejection and removal of the entire application.

B. Single Layer Gypsum Board on Furring
1. Apply gypsum board with long dimension at right angles to furring channel.
2. Center end joints over channel web; stagger end joints from those in adjacent rows of board.
3. Fasten boards to furring channels with screws spaced according to manufacturer's recommendations.

C. Double Layer Gypsum Board
1. Fasten base layer to studs or furring with screws, and attach face layer using laminating adhesive and screws, applied according to manufacturer's instructions.
2. Offset face-layer joints at least 10 inches from parallel base-layer joints.
3. Screw both layers to metal supports at double layer ceiling applications and where required for fire-rated construction.

D. Single Layer Gypsum Board Suspended for Ceilings:
1. Install the gypsum wallboard to ceilings with the long dimension of the wallboard at right angles to the supporting members.
2. Wallboard may be installed with the long dimension parallel to supporting members that are spaced 16" on centers when attachment members are provided at end joints.

3.06 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints
1. Install control joints at junction of gypsum board partitions with walls or partitions of other finish material.
2. Install control joints within long runs of partitions at approximately 30'-0" on center or as indicated on the drawing.
3. Install control joints at bulkheads as shown on the drawings but in no case shall they exceed 15”-0” on center or as indicated on the drawing. Contractor shall be responsible to insure that bulkheads comply with this requirement and shall coordinate locations with the architect if not shown on the drawings.
4. Where gypsum board is vertically continuous, as at stairwells, provide horizontal control joints at each floor level.
5. Special Trim: Install as indicated on Drawings and in accordance with manufacturer's instructions.
6. Install control joints at each door jamb from head of door ceiling as shown on the drawings.
7. Do not install control joints behind any applied wall coverings.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

D. Install metal casing bead trim whenever edge of gypsum board would otherwise be exposed or semi-exposed.

E. Special Trim and Reveal Joints: Install as indicated on Drawings and in accordance with manufacturer's instructions.

F. Moisture Guard Trim: Install on bottom edge of gypsum board according to manufacturer's instructions and in locations indicated on drawings.

3.07 JOINT TREATMENT

A. Finish gypsum board in accordance with levels defined in GA-214 , ASTM C840, and as follows:
   1. Level 1: Ceiling plenum areas and concealed areas, except provide higher level of finish as required to comply with fire resistance ratings and acoustical ratings.
   2. Level 2: Gypsum board substrate at tile, except remove tool marks and ridges.
   3. Level 3: Gypsum board surfaces, where textured finishes will be used.
   4. Level 4: Gypsum board surfaces scheduled to receive non-textured painted finishes, vinyl wall covering or custom covering is to be applied, except where another finish level is indicated.
   5. Level 5: Gypsum board surfaces scheduled to receive painted graphics or Dry-Erase Coating.

B. General:
   1. Inspect areas to be joint treated, verifying that the gypsum wallboard fits snugly against supporting framework.
   2. In areas where joint treatment and compound finishing will be performed, maintain a temperature of not less than 55 degrees for 24 hours prior to commencing the treatment, and until joint and finishing compounds have dried.
   3. Apply the joint treatment and finishing compound by machine or hand tool.
   4. Provide a minimum drying time of 24 hours between coats, with additional drying time in poorly ventilated areas.
   5. Joint Treatment is required at all gypsum board walls including fire protection assemblies above the ceiling line.

C. Embedding compounds:
   1. Apply to gypsum wallboard joints and fastener heads in a thin uniform layer.
   2. Spread the compound not less than 3" wide at joints, center the reinforcing tape in the joint, and embed the tape in the compound. Then spread a thin layer of compound over the tape.
   3. After this treatment has dried, apply a second coat of embedding compound to joints and fastener heads, spreading in a thin uniform coat to not less than 6" wide at joints, and feather edged.
   4. Sandpaper between coats as required.
   5. When thoroughly dry, sandpaper to eliminate ridges and high points.

3.08 TEXTURE FINISH

A. Apply finish texture coating by means of spraying apparatus in accordance with manufacturer's instructions.

B. Texture Required: Unless shown or otherwise indicated on the drawings, provide medium “Orange Peel or Spatter Finish” texture on walls or ceilings.

3.09 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

SECTION 09 2116.23
GYPSUM BOARD SHAFT WALL ASSEMBLIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Tested and rated gypsum board/steel stud enclosures for elevators, vertical and horizontal shaftways, and soffits.

1.02 RELATED SECTIONS:

A. Section 09 9000 – Painting and Coating

1.03 DEFINITIONS

A. Shaft Wall: An assembly of steel framing, gypsum boards, and other materials used to enclose elevator shaftways.

1.04 SYSTEM DESCRIPTION

A. Horizontal Shaft Wall Ceiling/Soffit Assembly;
   1. NER 258, 2 hr. Framing - steel studs 24 in. o.c. horizontally. Ductside - liner boards positioned into studs horizontally, roomside - horizontal gypsum base boards attached to studs horizontally, horizontal gypsum face boards attached to studs horizontally through base boards.

B. The shaft wall assembly for system shown must have following additional attributes:
   1. Must be UL Classified.
   2. Must be listed in National Evaluation Report NER-258.
   3. Must have been used in successful tests of all major elevator manufacturers' frames and doors at Underwriters Laboratories.
   4. Must be a component in the successful ASTM E152 test in which the door frames specified for this project were used.
   5. Must have undergone successful testing of penetration details for elevator call boxes and position indicators.
   6. Must have been successfully tested to at least 1,000,000 positive-negative pressure cycles.
   7. Must contain studs which give continuous edge support for liner boards to achieve airtight, smoke-tight, and rattle-free performance.
   8. Must be free from projecting, bendable tabs.

1.05 SUBMITTALS

A. Shop drawings, product data, and samples under provisions of Section 01 3300 – Submittal Procedures.

B. Product Data: Submit manufacturer's product specifications and installation instructions for systems shown.

C. Shop Drawings:
   1. Show shaft wall dimensions relative to other work.
   2. Locate all openings in shaft wall with details indicating special construction for work of other Sections and conformance with requirements of fire rated construction.

D. Quality Assurance/Control Submittals:

E. Certificates: Submit manufacturer's certification of compliance with fire and sound requirements for each system shown. Include name of manufacturer and complete description of door frames, elevator door frames, electrical boxes, and other penetrations included in each tested assembly for each system shown.

F. Additional Certificates: Submit manufacturer's certification of -

1. Fire test verification of shaft wall damper penetration conformance to applicable code requirements.
2. Fire test verification of horizontal shaft wall assembly conformance to applicable code requirements.
3. For each system enclosing elevators, successful completion of fatigue failure resistance of shaft walls through 1,000,000 cycles at a pressure of 7.5 psf with a maximum deflection of L/240.
4. Compliance of shaft wall assembly or assemblies with applicable code.

G. Closeout Submittals:
1. Submit under provisions of Section 01 7800 – Closeout Submittals.
2. Submit Material Safety Data Sheets under provisions of Section 01 7800 – Closeout Submittals for the following items:
a. All mastics, glues, and adhesives
b. Gypsum board, tape and bed
c. Sealant (interior use only)
d. Sprayed-on or troweled-on fireproofing or decorative finish

1.06 QUALITY ASSURANCE

A. Qualifications:
1. Single Source Responsibility: Provide steel framing, gypsum boards, insulation, fasteners, joint treatments, and other materials in the assembly or assemblies from the single manufacturer which has utilized these materials in recognized fire containment and sound tests.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Section 01 6600 – Product Storage and Handling Requirements.

1.08 PROJECT CONDITIONS

A. Project Environmental Requirements
1. Comply with requirements of referenced standards and recommendations of material manufacturers for environmental conditions before, during, and after installation.
2. Do no joint finishing when temperature in space being finished is less than 55oF. Ventilation must be adequate to carry off excess moisture.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements indicated herein, provide products of one of the listed manufacturers.

B. Shaft Wall Assembly:
1. CertainTeed Corporation: www.certainteed.com.
2. Georgia-Pacific Gypsum: www.gpgypsum.com.
3. National Gypsum Company: www.nationalgypsum.com.
4. USG Corporation: www.usg.com.
5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FRAMING

A. Runners:
1. J-Runners; Galvanized steel; width and metal thickness (24 ga minimum) to accommodate adequately loads imposed from studs selected from stud manufacturer's published limiting height table; 400JR20; lengths as required; ASTM C645.
2. Runner Fasteners: Power-driven type; must withstand 193 lb single shear and 200 lb bearing force when driven into sill without exceeding allowable design stress in runner, fastener, or structural support.

B. Studs:
   1. CH-Studs; Galvanized steel; width and metal thickness (25 ga minimum) as selected from stud manufacturer's published limiting height table; 400CH20, unspliced lengths, as required, providing continuous edge support for liner board edges; ASTM C645;

C. Selection Criteria:
   1. Stud, runner, and strut selection based upon:
      a. Design load(s): Intermittent air pressure load as selected from stud manufacturer's published limiting height table; 15 psf.
      b. Allowable deflection: As selected from stud manufacturer's published limiting height table; L/360.
      c. End reaction and bending stress: Do not exceed maximum allowable for given stud height.
   2. Studs, runners, and struts must have the same, or greater, section properties as those used in the initial fire containment and sound tests.

D. Other Metal Components:
   1. Jamb Struts: Galvanized steel, 20 ga; 3 in. back leg, same width as steel studs; lengths, as required; ASTM C 645.
   2. Z-Clips: Galvanized steel; 16 ga x runner or stud width x stand-off distance x 1-1/2 in. each leg; ASTM A 446/A 446 M, A 525.

2.03 GYPSUM BOARD

A. Liner boards: Gypsum boards; 1 in. thick x 24 in. wide x lengths as required; beveled edges, water resistant green face paper; with UL Classification Label affixed; exceed ASTM C442.

B. Base boards; Gypsum boards; 5/8 in. thick x 48 in. wide x lengths as required; tapered edges; with UL Classification Label affixed; ASTM C36; Basis of Design Product: USG; FIRECODE C Core, SHEETROCK Brand.

C. Face boards, Gypsum boards; 5/8 in. thick x 48 in. wide x lengths as required; tapered edges; with UL Classification Label affixed; ASTM C36; Basis of Design Product: USG; FIRECODE C Core, SHEETROCK Brand.

2.04 SOUND INSULATION

A. Blankets; Paperless, semi-rigid spun mineral fiber mat, 1-1/2 in. thick; ASTM C665, Type I; equal to THERMAFIBER Sound Attenuation Fire Blankets (SAFB).

2.05 MISCELLANEOUS MATERIALS

A. Corner Reinforcement:
   1. External corner reinforcement: Galvanized steel; 1-1/4 x 1-1/4 in., lengths as required; ASTM A446/A446M, A526 Coating Designation Z90.; Basis of Design Product: USG; No.103.

B. Metal Trim:
   1. L-shaped: Galvanized steel; 1/2 in., lengths as required; ASTM A446/A446M, A526 Coating Designation Z90.; Basis of Design Product: USG; No. 200-B.

C. Fasteners:
   1. Steel framing: Steel screws; lengths as recommended by gypsum board products manufacturer; Type S, pan head; ASTM C1002.
   2. Steel framing: Steel screws; lengths as recommended by gypsum board products manufacturer; Type S-12, pan head and low-profile head ASTM C954.
   3. Gypsum board to steel framing: Steel screws; lengths as recommended by gypsum board products manufacturer, Type S-12 bugle head and pancake head; ASTM C954.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Site Verification of Conditions:
   1. Examine locations to receive materials for conditions which will affect adversely installation. Do not start materials installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Comply with provisions of Section 01 7000 – Execution and Closeout Requirements.
   1. Field Dimensions: Verify location and dimensions where materials are to be installed.
   2. Review shop drawings and coordinate work of other Sections which is integral with shaft wall installation.

3.03 INSTALLATION

A. Comply with provisions of Section 01 7000 – Execution and Closeout Requirements.

B. Comply with gypsum products manufacturer's published instructions.

3.04 FINISHING

A. Refer to section 09 9000 – Painting and Coating for texturing of gypsum board.

3.05 CLEANING AND POLISHING

A. Cleaning
   1. Comply with requirements of Section 01 7000 – Execution and Closeout Requirements.

END OF SECTION

SECTION 09 2226
SUSPENSION SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Related Documents: General and Supplementary Conditions of the Contract, Division 1 General Requirements, and Drawings are applicable to this Section.

B. Section Includes, but is not limited to:
   1. Metal suspension systems.
   2. Trim and accessories.

C. Related Sections:
   1. Section 05 4000 – Cold-Formed Metal Framing
   2. Section 09 2982 – Gypsum Board
   3. Section 09 5100 – Acoustical Ceilings
   4. Section 09 9000 – Painting and Coating

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. A635 - Standard Specification for Sheet Steel.
   2. A641 - Standard Specification for Zinc-Coated Carbon Steel Wire
   3. C754 - Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Board.
   4. C1002 - Specification for Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases.
   5. E119 - Standard Test Methods for Fire Tests of Building Construction and Materials

B. Association References:
   1. Gypsum Association GA 216, "Recommended Specifications for the Application and Finishing of Gypsum Board”
   2. Comply with "Specifications for Metal Lathing and Furring" published by the Metal Lath/Steel Framing Association.

1.03 SYSTEM DESCRIPTION

A. Design Requirements: Fabricate and install systems as indicated but not less than that required to comply with ASTM C754 under the following conditions:
   1. Interior suspended ceilings and soffits: Maximum deflection of 1/360 of distance between supports.
   2. Exterior soffits: Withstand minimum positive and negative pressure of 20 psf with maximum deflection of 1/360 of distance between supports.
   3. Fire Resistance Ratings: Where fire resistance classifications are indicated, provide materials and application procedures identical to those listed by UL or tested according to ASTM E119 for type of construction shown.

1.04 SUBMITTALS

A. Product Data: Submit product data sheets on the following materials. Data sheets shall be marked to indicate the product and sizes used.
   1. Metal Framing and Furring Materials

1.05 QUALITY ASSURANCE

A. Qualifications:
   1. Single Source Responsibility:
      a. Obtain metal framing from a single manufacturer.

B. Reference Standards:

1. Applicable requirements of ASTM C754 for installation of steel framing.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Section 01 6000 – Product Requirements.

B. Acceptance at Site
   1. Deliver material to site promptly without undue exposure to weather.
   2. Deliver in manufacturer's unopened containers or bundles, fully identified with name, brand, type and grade.

C. Storage and Protection
   1. Protect materials from contamination, dampness, freezing, or overheating in accordance with manufacturer's instructions.
   2. Store above ground in dry, ventilated space.
   3. Protect materials from soiling, rusting and damage.

1.07 PROJECT CONDITIONS

A. Project Environmental Requirements
   1. Comply with requirements of referenced standards and recommendations of material manufacturers for environmental conditions before, during, and after installation.
   2. Maintain illumination as required for proper installation of material.

1.08 WARRANTY

A. Comply with requirements of Section 01 7800 – Closeout Submittals.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements indicated herein, provide products of one of the listed manufacturers.

B. Suspension Systems:
   1. Armstrong World Industries, Inc: www.armstrong.com.
   2. CertainTeed Corporation: www.certainteed.com.
   3. USG: www.usg.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 CEILING AND SOFFIT SUPPORT MATERIALS

A. Hanger Anchorage Devices: Screws, clips, bolts or other devices compatible with indicated structural anchorage for ceiling hangers and whose suitability has been proven through standard construction practices or by certified test data.

B. Hangers
   1. Grade: Steel wire or rods, sizes to comply with requirements of ASTM C754 for ceiling or soffit area and loads to be supported.
      a. Wire: ASTM A 641, soft, Class 1 galvanized.
      b. Rods and flats: Mild steel components.
   2. Finish: Galvanized or painted with rust-inhibitive paint for interior Work; galvanized for exterior Work.

C. Framing System
   1. Grade: Framing system for gypsum board panels consisting of cold-rolled steel members conforming to ASTM C635.
   2. Finish: Exposed surfaces finished in manufacturer’s standard enamel paint finish.
   3. Fire Rating: Rating in accordance with U.L. assembly as indicated on the drawings.
   4. Components: Main tees, furring cross channels, furring cross tees, and cross tees.
      a. Main Tees: Heavy Duty classification 1-1/2” high x 144” long, integral reversible splice with knurled face. (Fire rated where required).

b. Cross Members: Members with knurled face. Cross Tees: 1-1/2” high x 48” long with 1-1/2” wide face; quick release cross tee ends for positive locking and removability without tools. (Fire rated where required).
c. Accessory Cross Tees: Cross tees must have knurled faces and quick release cross tee ends for positive locking and removability without tools.

5. Accessories:
a. U-shaped perimeter channel molding.
b. Galvanized carbon steel (12 ga.) hanger wire.

D. Hanger Wire Sound Isolators: Provide where indicated for sound-rated suspended ceilings.

E. Miscellaneous Accessories: Provide as required for complete installations.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Install in accordance with reference standards and manufacturer's instructions.

B. Tolerances:
1. Do not exceed 1/8 inch in 8'-0" variation from plumb or level in exposed lines of surface, except at joints between gypsum board units.
2. Do not exceed 1/16 inch variation between planes of abutting edges or ends.
3. Shim as required to comply with specified tolerances.

C. Install framing to comply with ASTM C754 and with ASTM C840 requirements that apply to framing installation.

3.02 EXAMINATION

A. Site Verification of Conditions:
1. Examine substrates and adjoining construction and conditions under which Work is to be installed. Do not proceed with Work until unsatisfactory conditions are corrected.

3.03 INSTALLATION

A. Comply with provisions of Section 01 7000 – Execution and Closeout Requirements.

3.04 METAL SUPPORT INSTALLATION

A. Ceiling Support Systems
1. Secure hangers or rods to structural support by connecting directly to structure where possible; otherwise connect to inserts, clips or other anchorage devices or fasteners indicated.
2. Space main runners, hangers and furring according to requirements of ASTM C754, except as otherwise indicated.
3. Where spacing of structural members, or width of ducts or other equipment, prevents regular spacing of hangers, provide supplemental hangers and suspension members and reinforce nearest affected hangers to span extra distance.
4. Attach directly to structural elements only, do not attach to metal deck. Loop hangers and wire-tie directly or provide anchors or inserts.

3.05 ADJUSTING

A. Correct damage and defects which may telegraph through finished work.

B. Leave Work smooth and uniform.

3.06 CLEANING

A. Comply with requirements of Section 01 7000 – Execution and Closeout Requirements.

B. At completion of each segment of installation in a room or space, promptly pick up and remove from the working area all scrap, debris, and surplus material of this Section.

END OF SECTION

SECTION 09 2236
LATH

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal lath for cement plaster.

B. Furring for metal lath.

C. Metal ceiling framing.

1.02 RELATED REQUIREMENTS

A. Section 05 4000 - Cold-Formed Metal Framing: Sheathing on exterior walls.

B. Section 07 2500 - Weather Barriers: Weather barrier under exterior plaster and stucco.

C. Section 09 2400 - Cement Plastering.

1.03 REFERENCE STANDARDS

A. ASTM C841 - Standard Specification for Installation of Interior Lathing and Furring; 2003 (Reapproved 2018).

B. ASTM C847 - Standard Specification for Metal Lath; 2018.

C. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2018.

D. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2020.

E. ASTM C1063 - Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster; 2019a.

F. ASTM C1787 - Standard Specification for Installation of Non Metallic Plaster Bases (Lath) Used with Portland Cement Based Plaster in Vertical Wall Applications; 2014.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on furring and lathing components, structural characteristics, material limitations, and finish.

1.05 QUALITY ASSURANCE

A. Maintain one copy of each installation standard referenced on site throughout the duration of lathing and plastering work.

B. Installer Qualifications: Company specializing in performing the work of this section with at least five years of documented experience.

C. Mock-ups
   1. Lath and plaster an actual wall surface for each finish specified to show color, texture, and workmanship. Provide mock-ups of at least 100 sq. ft. Obtain the Architect's approval of mock-up locations.
   2. Simulate finished lighting conditions for the Architect's review of mock-up.
   3. Do not start plastering until the Architect approves mock-up. Provide additional mock-ups if necessary to obtain approval. Do not alter mock-ups until plastering is completed.
   4. The mock-ups may be part of the Work, and may be incorporated into the finished Work when so approved by the Architect.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Lath and Accessories:
   1. Cemco: www.cemcosteel.com.
   2. Clarkwestern Dietrich Building Systems LLC: www.clarkdietrich.com.
   3. Milcor Corporation: www.milcorlp.com.
   4. National Gypsum Company: www.national-gypsum.com.
   5. Niles Building Products: www.nilesbldg.com.
   6. United States Gypsum Company (USG): www.usg.com.

2.02 FRAMING AND LATH ASSEMBLIES

A. Provide completed assemblies with the following characteristics:
   1. Maximum Deflection of Vertical Assemblies: 1:360 under lateral point load of 100 lbs.
   2. Maximum Deflection of Horizontal Assemblies: 1:240 deflection under dead loads and wind uplift.

B. Fire Rated Assemblies: Provide components complying with requirements for fire rated assemblies specified in the section where the plaster finish is specified.

2.03 FRAMING MATERIALS

A. Furring Channels: Formed steel, minimum 0.05 inch thick, 3/8 inch deep by 3/4 inch high, splicing permitted; galvanized.

B. Main Ceiling Channels: Formed steel, asphalt coated, minimum 0.05 inch thick, 3/4 inch deep by 1-1/2 inch high, single piece, no splicing; galvanized.

C. Hangers: Steel wire, of size and type to suit application, to support ceiling components in place to deflection limits as indicated.

D. Ceiling Hangers: Rolled steel sections, of size and type to suit application, to rigidly support ceiling components in place to deflection limits as indicated; galvanized.

E. Lateral Bracing: Formed steel, minimum 0.060 inch thick, size and length as required; galvanized.

2.04 LATH

A. Diamond Mesh Metal Lath: ASTM C847, galvanized; self-furring.
   1. Weight: To suit applicationcomply with deflection criteria and as specified in ASTM C841 or ASTM C1063 for framing spacing.
   2. Weight: 3.4 lb/sq yd.

B. Corner Mesh: Formed sheet steel, minimum 0.018 inch thick, expanded flanges shaped to permit complete embedding in plaster, minimum 2 inch size; same finish as lath.

C. Strip Mesh: Expanded metal lath, same weight as lath, 2 inch wide by 24 inch long; same finish as lath.

D. Beads, Screeds, Joint Accessories, and Other Trim: Depth governed by plaster thickness, and maximum possible lengths.
   1. Material: Formed zinc, expanded metal flanges.
   2. Casing Beads with Weep Holes: Square edges.
   3. Corner Beads: Radiused corners.
   4. Base Screeds: Bevelled edges.
   5. Expansion Joints: Accordion profile with factory-installed protective tape, 2 inch wide flanges.
   6. Control Joints: Accordion profile with factory-installed protective tape, 2 inch flanges.
   7. Soffit Vents: Continuous one-piece Soffit Vent with reinforcing rib to key into stucco and plaster.

8. Reveal Molding: Profile and size as noted on the drawings and as required for the specific application.

2.05 ACCESSORIES

A. Access Panels: As specified in Section 08 3100.

B. Anchorage: Tie wire, nails, and other metal supports, of type and size to suit application; to rigidly secure materials in place, minimum G90, hot dipped galvanized.

C. Fasteners: Self-piercing tapping screws; ASTM C1002 or ASTM C954.

D. Tie Wire: Annealed galvanized steel.

E. Felt Bond Breaker: Asphalt impregnated felt building paper, equivalent to two layers Grade "D" paper as required by Code.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that substrates are ready to receive work and conditions are suitable for application.

C. Do not begin until unacceptable conditions have been corrected.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 INSTALLATION - GENERAL

A. Install metal lath and furring for Portland cement plaster in accordance with ASTM C1063.

B. Install lath and furring for fire-rated assemblies in accordance with requirements of assembly as indicated.

3.03 WALL FURRING INSTALLATION

A. Install wall furring by directly attaching to masonry and concrete walls.

B. Install furring channels horizontally; secure with fasteners on alternate channel flanges at maximum 16 inches on center.

C. Space furring channels maximum 16 inches on center, and not more than 4 inches away from floor and ceiling lines.

3.04 CEILING AND SOFFIT FRAMING INSTALLATION

A. Install furring after work above ceiling or soffit is complete. Coordinate the location of hangers with other work.

B. Install furring independent of walls, columns, and above-ceiling work.

C. Securely anchor hangers to structural members or embed in structural slab. Space hangers as required to limit deflection to criteria indicated. Use rigid hangers at exterior soffits.

D. Space main carrying channels at maximum 24 inch on center, and not more than 6 inches from wall surfaces. Lap splice securely.

E. Securely fix carrying channels to hangers to prevent turning or twisting and to transmit full load to hangers.

F. Install furring channels perpendicular to carrying channels at 8" on center, not more than 2 inches from perimeter walls, and rigidly secure. Lap splices securely.

G. Reinforce openings in suspension system that interrupt main carrying channels or furring channels with lateral channel bracing. Extend bracing minimum 24 inches past each opening.

H. Laterally brace suspension system.

3.05 CONTROL AND EXPANSION JOINT INSTALLATION

A. Locate joints as indicated on drawings and comply with ASTM C1063.

B. Install expansion joints where an expansion joint occurs in base exterior wall.

C. Install prefabricated joint accessories in accordance with ASTM C1063.

D. Construct expansion joints and control joints of back-to-back casing beads with a backer rod and sealant, set 1/4 inch apart. Lath to be cut at these joints in accordance with ASTM C1063.

E. Install control joints at bulkheads as shown on the drawings but in no case shall they exceed 15”-0” on center, height to length ratio of 2.5, or 144 square feet max area per Code or as indicated on the drawing. Contractor shall be responsible to insure that bulkheads comply with this requirement and shall coordinate locations with the architect if not shown on the drawings.

F. At walls, install control joints within long runs of partitions at approximately 30'-0" on center or as indicated on the drawing.

3.06 ACCESS PANELS INSTALLATION

A. Install access panels and rigidly secure in place.

B. Install frames plumb and level in opening. Secure rigidly in place.

C. Position to provide convenient access to concealed work requiring access.

3.07 LATH INSTALLATION

A. Apply lath taut, with long dimension perpendicular to supports.

B. Lap or nest ends of metal lath in accordance with ASTM C841.

C. Lap ends of non-metallic lath in accordance with ASTM C1787.

D. Attach metal lath to metal supports using tie wire at maximum 6 inches on center.

E. Attach metal lath to concrete using wire loops. Attach anchors to backup surface; space at maximum 24 inches on center. In accordance with ASTM C1063, accessories must be attached 7" o.c. max; provide zee furring over concrete and CMU unless otherwise noted.

F. Continuously reinforce internal angles with corner mesh, except where the metal lath returns 3 inches from corner to form the angle reinforcement; fasten at perimeter edges only.

G. Place corner bead at external wall corners; fasten at outer edges of lath only.

H. Place perforated casing beads or weep screeds at termination of plaster areas; secure rigidly in place.

I. Place lath vertically above each top corner and each side of door frames to 6 inches above ceiling line.

J. Place casing beads at terminations of plaster finish. Butt and align ends. Secure rigidly in place.

K. Place additional strip mesh diagonally at corners of lathed openings. Secure rigidly in place.

L. Install foundation weep screeds at the bottom of exterior walls so it extends below the floor line where the wall is supported by a floor or a foundation. Through wall flashing shall be provided behind foundation weep screed.

3.08 TOLERANCES

A. Maximum Variation from True Lines and Levels: 1/8 inch in 10 feet.

B. Maximum Variation from True Position: 1/8 inch.

END OF SECTION

SECTION 09 2400
CEMENT PLASTERING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cement plaster for installation over metal lath, masonry, concrete, and solid surfaces.

1.02 RELATED REQUIREMENTS

A. Section 05 4000 - Cold-Formed Metal Framing: Structural metal framing for plaster.

B. Section 06 1000 - Rough Carpentry: Wood stud framing for plaster.

C. Section 09 2236.23 - Metal Lath: Metal furring and lathing for plaster.

1.03 REFERENCE STANDARDS

A. ASTM C926 - Standard Specification for Application of Portland Cement-Based Plaster; 2018a.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittals procedures.

B. Product Data: Provide data on plaster materials, characteristics and limitations of products specified.

C. Samples: Submit two samples, 6 by 6 inch in size illustrating finish color and texture.

D. Closeout Submittals:
   1. Submit under provisions of Section 01 7800 – Closeout Submittals.
   2. Submit Material Safety Data Sheets under provisions of Section 01 7800 – Closeout Submittals for the following items:
      a. Sprayed-on or troweled-on fireproofing or decorative finish.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. Minimum of twenty (20) years experience in manufacture of stucco products.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience.
   1. Employ skilled mechanics that are experienced and knowledgeable in cement stucco application, and familiar with the requirements of the specified work.
   2. Successful completion of minimum of ten (10) projects of similar size and complexity to the specified project.
   3. Provide the proper equipment, manpower and supervision on the job site to install the system in compliance with manufacturer’s published specifications and details and the project plans and specifications.

C. Pre-installation Meetings
   1. Comply with provisions of Section 01 3000 – Administrative Requirements.

D. Copies of Documents at Project Site: Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.06 MOCK-UP

A. Lath and plaster an actual wall surface for each finish specified to show color, texture, and workmanship. Provide mock-ups of at least 100 sq. ft. Obtain the Architect's approval of mock-up locations.

B. Simulate finished lighting conditions for the Architect's review of mock-up.

C. Do not start plastering until the Architect approves mock-up. Provide additional mock-ups if necessary to obtain approval. Do not alter mock-ups until plastering is completed.

D. Locate where directed.

E. Accepted mock-up may remain as part of the Work.

1.07 FIELD CONDITIONS

A. Do not apply plaster when substrate or ambient air temperature is under 50 degrees F or over 80 degrees F.

B. Maintain minimum ambient temperature of 50 degrees F during installation of plaster and until cured.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide a warrantable assembly.

C. Correct defective Work within a one year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements indicated herein, provide products of one of the listed manufacturers.
   1. BASF Finestone: www.Finestone.BASF.com.
   2. Parex USA, Inc.: www.parexusa.com.
   3. STO Corporation: www.stocorp.com.
   4. TXI – Lone Star: www.txi.com.
   5. Substitutions: Under provisions of Section 01 6000 – Product Requirements

2.02 CEMENT PLASTER ASSEMBLIES

A. Interior/Exterior Stucco: Cement plaster system, made of finish, brown, and scratch coat and reinforcing mesh.

2.03 PLASTER MATERIALS

A. Premixed Scratch and Brown: Mixture of cement, aggregate, and proprietary admixtures for scratch and brown coats, installed in accordance with ASTM C926.

B. Water: Clean, fresh, potable and free of mineral or organic matter that could adversely affect plaster.

C. Admixture: Use stucco base manufacturer's listed admixture.

D. Primer (required): Acrylic primer by the finish coat manufacturer.

E. Finish Coat: Integrally colored acrylic type, color as selected.
   1. For finish coat: As selected from the manufacturers full range of color.
      a. BASF Finestone Pebbletex or Aggrelastic Finishes.
      b. Parex USA DPR or Elastic Finishes.
      c. STO Stolit Acrylic or Aggrelastic Finishes.
      d. Substitutions: See Section 01 6000 - Product Requirements.

F. Bonding Agent: ASTM C 932; type recommended for bonding plaster to concrete and concrete masonry surfaces .

2.04 METAL LATH

A. Metal Lath: Felt behind plaster and Accessories: In accordance with ASTM C1063 and as specified in Section 09 2236.23.

B. Beads, Screeds, and Joint Accessories: In accordance with ASTM C1063 and as specified in Section 09 2236.23.

2.05 WEATHER BARRIER

A. As specified in Section 07 2500 – Weather Barriers.

2.06 PLASTER MIXES

A. Over Solid Bases: Three-coat application, mixed and proportioned in accordance with ASTM C926.

B. Over Metal Lath: Three-coat application, mixed and proportioned in accordance with ASTM C926.

C. Mix only as much plaster as can be used prior to initial set.

D. Mix materials dry, to uniform color and consistency, before adding water.

E. Add air entrainment admixtures to all coats to provide 5-7 percent entrainment.

F. Protect mixtures from freezing, frost, contamination, and excessive evaporation.

G. Do not retemper mixes after initial set has occurred.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify the suitability of existing conditions before starting work.

B. Masonry: Verify joints are cut flush and surface is ready to receive work of this section. Verify no bituminous or water repellent coatings exist on masonry surface.

C. Concrete: Verify surfaces are flat, honeycomb are filled flush, and surfaces are ready to receive work of this section. Verify no bituminous, water repellent, or form release agents exist on concrete surface that are detrimental to plaster bond.

D. Metal Lath and Accessories: Verify lath is flat, secured to substrate, and joint and surface perimeter accessories are in place.

E. Mechanical and Electrical: Verify services within walls have been tested and approved.

3.02 PREPARATION

A. Dampen masonry surfaces to reduce excessive suction.

B. Clean concrete surfaces of foreign matter. Clean surfaces using acid solutions, solvents, or detergents. Wash surfaces with clean water.

C. Roughen smooth concrete surfaces and apply bonding agent in accordance with manufacturer's instructions.

3.03 PLASTERING

A. Apply premixed plaster in accordance with manufacturer's instructions.

B. Apply plaster in accordance with ASTM C926.

C. Control Joint Installation:
   1. Joint spacing shall not be greater than 18 feet.
   2. No panel shall exceed 144 sq.ft. on vertical applications.
   3. No panel shall exceed 100 sq.ft. over curved or angular sections.
   4. No length-to-width ratio shall exceed 2 ½ to 1 in any given panel.

D. Installation over cast-in-place concrete or concrete masonry units:
   1. Concrete and concrete masonry units require minimum 28-day cure before the installation of stucco. The requirement for a control joint every 144 sq.ft. may be waived on solid substrates without metal lath such as cast-in-place concrete and concrete masonry units provided joints in the supporting construction exist at appropriate intervals and they are reflected in the stucco. In such cases joint spacing in the stucco shall not exceed 250 sq.ft.

2. Pre-moisten concrete masonry units and absorbent concrete prior to the placement of stucco.
3. Scratch Coat: apply the stucco with sufficient pressure to ensure intimate contact with the substrate and complete coverage to an approximate thickness of 1/4 inch. Score the stucco upon completion of each panel in preparation for a second coat. Score horizontally.
4. Moist cure after the stucco has set by lightly fogging the surface for at least 48-hours (unless brown coat is applied as soon as the scratch coat has achieved suffcient rigidity to support the brown coat). Fog as frequently as required during the 48-hour period to prevent loss of moisture from the stucco. Avoid eroding the stucco surface with excess moisture. If relative humidity exceeds 75% the frequency of moist-curing can be diminished.
5. Brown Coat: As soon as the first coat is firm enough to receive the second coat without damage, apply the second coat with sufficient pressure to ensure intimate contact with the first coat to an approximate thickness of 1/8 or 1/4 inch and as needed to bring the stucco to the desired thickness. Use a rod or straight edge to bring the surface to a true, even plane. Fill depressions in plane with stucco.
6. After the stucco has lost sufficient moisture so that the surface sheen has disappeared, float the surface lightly with a darby or wood float to densify the surface and to provide a smooth, even surface. Float before the stucco becomes so rigid that it cannot be moved beneath the float.
7. Moist cure after the stucco has set by lightly fogging the surface for at least 48-hours. Fog as frequently as required during the 48-hour period to prevent loss of moisture from the stucco. Avoid eroding the stucco surface with excess moisture. If relative humidity exceeds 75% the frequency of moist-curing can be diminished.

E. Installation over frame construction with sheathing:
1. Scratch Coat: Apply stucco with sufficient pressure to key into and embed the metal lath. Apply sufficient material, approximately 3/8 inch, to cover the metal lath and to permit scoring the surface. Score the stucco upon completion of each panel in preparation for a second coat. Score horizontally.
2. Brown Coat: as soon as the first coat is firm enough to receive the second coat without damage, apply the second coat with sufficient pressure to ensure intimate contact with the first coat to an approximate thickness of 1/8, 1/4 or 3/8 inch as needed to bring the stucco to a uniform thickness that matches the grounds of the accessories. Use a rod or straight edge to bring the surface to a true, even plane. Fill depressions in plane with stucco.
3. After the stucco has become slightly firm float the surface lightly with a darby or wood float to densify the surface and to provide a smooth, even surface.
4. Moist cure after the stucco has set by lightly fogging for at least 48 hours.
5. Fog as frequently as required during the 48 hour period to prevent loss of moisture from the stucco. Avoid eroding the stucco surface with excess moisture. If relative humidity exceeds 75% the frequency of moist curing can be diminished.

F. After curing, allow to dry the amount of time required by the primer/finish coat manufacturer.

G. Finish Texture: Float to a consistent finish.

H. Avoid excessive working of surface. Delay troweling as long as possible to avoid drawing excess fines to surface.

3.04 TOLERANCES

A. Maximum Variation from True Flatness: 1/8 inch in 10 feet.

3.05 ADJUSTING

A. Upon completion of the other work of this Section, inspect all cement plaster surfaces and correct conditions that do not meet specified requirements.

B. Remove protective materials and plaster materials from adjacent surfaces, and remove stains that would adversely affect finishes.

3.06 CLEANING

A. Comply with requirements of Section 01 7000 – Execution and Closeout Requirements.

3.07 PROTECTION

A. Protect work so that it will be without any evidence of damage or use at time of acceptance.

B. Provide protection of installed materials from water infiltration into or behind them.

C. Provide protection of installed stucco from dust, dirt, precipitation, and freezing.

D. Provide protection of installed primer and finish from dust, dirt, precipitation, freezing and continuous high humidity until fully dry.

END OF SECTION

SECTION 09 3000
TILING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tile for floor applications.

B. Tile for wall applications.

C. Trim and accessories.

1.02 RELATED REQUIREMENTS

A. Section 04 2000 - Unit Masonry.

B. Section 05 4000 - Cold-Formed Metal Framing.

C. Section 07 9200 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.

D. Section 07 9513 - Expansion Joint Cover Assemblies: Expansion joint components.

E. Section 09 2116 - Gypsum Board Assemblies: Tile backer board.

1.03 REFERENCE STANDARDS

A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2017.

B. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2016a.

C. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2019.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, and setting details.

D. Samples: Mount tile and apply grout on two plywood panels, minimum 12 by 12 inches in size illustrating pattern, color variations, and grout joint size variations.

E. Grout: Submit manufacturer's full range of standard and designated color samples for each type of grout for Architect's selection.

F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

G. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Tile: At completion of project, deliver to Owner extra stock of materials used on project as follows:
      a. Two (2) cartons of each color of floor tile.
      b. Two (2) cartons of each color of wall tile.
      c. Thirty (30) lineal feet of each color and type of base.
   3. Store in location as directed by Owner.

4. Ensure materials are boxed and identified by manufacturer, type, and color.

1.06 QUALITY ASSURANCE

A. Maintain one copy of and ANSI A108/A118/A136 and TCNA (HB) on site.

B. Manufacturer Qualifications:
   1. Tile: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.
   2. Setting Materials: Minimum ten years experience in manufacturing the types of setting and grout materials specified.
   3. Membrane: Minimum five years experience in manufacturing the types of membrane materials specified.

C. Installer Qualifications: Company specializing in performing tile installation, with minimum of five years of documented experience.

1.07 MOCK-UP

A. See Section 01 4000 - Quality Requirements, for general requirements for mock-up.

B. Construct tile mock-up where determined by the Architect, incorporating all components specified for the location.
   1. Minimum size of mock-up is full height of wall, 6'-0" long or as determined by the Architect to incorporate all components. More that one mock-up may be required to demonstrate all materials in the project.
   2. Mock-up shall be approved by the Architect or Architect's representative. Approved mock-up may remain as part of the Work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.09 FIELD CONDITIONS

A. Do not install solvent-based products in an unventilated environment.

B. Maintain ambient and substrate temperature of no less than 50 degrees F and no more than 100 degrees F during installation of mortar materials.

1.10 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Submit a written warranty, executed by the Contractor, Installer, and Manufacturer, agreeing to repair or replace tile that fails in materials or workmanship within the specified warranty period.
   1. Warranty Period: One (1) year after date of Substantial Completion.

PART 2 PRODUCTS

2.01 TILE

A. Manufacturers: All products by the same manufacturer.
   1. American Olean Corporation: www.americanolean.com/#sle.
   2. Arizona Tile: www.arizonatile.com.
   3. Concept Surfaces: www.conceptsurfaces.com.
   4. Crossville Inc.: www.crossvilleinc.com.
   5. Dal-Tile Corporation: www.daltile.com/#sle.
   6. Emser Tile, LLC: www.emser.com/#sle.
   7. Horizon Italian Tile: www.horizontile.com.
   8. Pantheon: pantheontile.com.
   9. Trinity Surfaces: www.trinitysurfaces.com.
   10. Substitutions: See Section 01 6000 - Product Requirements.

B. Ceramic Tile: ANSI A137.1, standard grade.

1. Moisture Absorption: 7.0 to 20.0 percent as tested in accordance with ASTM C373.
2. Size: As scheduled.
3. Edges: Square.
4. Surface Finish: Matte glaze.
5. Product and Color(s): See drawings for Schedule of Materials and Colors.
6. Trim Units: Matching bead, bullnose, cove, and base shapes in sizes indicated.

C. Quarry Tile: ANSI A137.1, standard grade.
1. Moisture Absorption: 0.5 to 3.0 percent as tested in accordance with ASTM C373.
2. Size: As scheduled.
3. Thickness: 1/2 inch, nominal.
4. Edges: Square.
5. Surface Finish: Matte glazed.
6. Provide 3/16" grout joints at quarry tile locations.
7. Product and Color(s): See drawings for Schedule of Materials and Colors.
8. Trim Units: Matching bullnose, cove, cove base, and window sill or step nosing shapes in sizes indicated.

D. Porcelain Tile: ANSI A137.1, standard grade.
1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
2. Size: As scheduled.
3. Thickness: 3/8 inch.
4. Edges: Square.
5. Surface Finish: Matte glazed.
6. Product and Color(s): See drawings for Schedule of Materials and Colors.
7. Trim Units: Matching bullnose, double bullnose, cove base, cove, and window sill or step nosing shapes in sizes indicated.
8. Provide Large Format Tile mortar as required according to manufacturer's recommendation.

2.02 TRIM AND ACCESSORIES

A. Trim: Matching bullnose, cove base, and window sill or step nosing shapes in sizes coordinated with field tile.
1. Applications:
a. Open Edges: Bullnose.
b. Inside Corners: Jointed.
c. Floor to Wall Joints: Cove base.
2. Manufacturers: Same as for tile.

B. Trim: Brushed stainless steel, style and dimensions to suit application, for setting using tile mortar or adhesive.
1. Applications:
a. Wall corners, outside.
1) Roll formed 304 (1.4301 = V2A) (EB) brushed stainless steel, perforated anchoring leg, square outer corner with 1/4" radius along the surface edge.
2) Equal to Schluter - QUADEC.
3) Size: As required for tile.
4) Accessories:
(a) Outside Corner Endcap
(b) Connector (stainless steel)
b. Wall edges, top.
1) L-shaped profile with 1/8" wide top section and vertical wall section that together form the visible surface, integrated trapezoid-perforated anchoring leg, and integrated grout joint spacer.

2) Material and Finish: EB - Brushed Stainless Steel Type 304 = V2A.
3) Equal to Schluter - SCHIENE.
4) Size: As required for tile.
5) Accessories:
(a) Outside Corner Endcap
(b) Connector (stainless steel)

c. Floor to wall joints when coved base is not availible.
1) Roll formed 304 (1.4301 = V2A) (EB) brushed stainless steel profile with integrated trapezoid-perforated anchoring legs, connected at a 90 degree angle by a core-shaped section with 3/8 inch radius that forms the visible surface.
2) Equal to Schluter DILEX-EHK.
3) Size: As required for tile.
4) Accessories:
(a) Outside Corner (90 degrees)
(b) Inside Corner, 2-way (90 degrees)
(c) Connector
(d) End Cap

d. Borders and other trim as indicated on drawings.

2. Manufacturers:
a. Schluter-Systems: www.schluter.com/#sle.
b. Substitutions: See Section 01 6000 - Product Requirements.

C. Thresholds: Marble, solid surface or other material as indicated on the drawings; color as selected, honed finish; 2 inches wide by full width of wall or frame opening; 1/2 inch thick; beveled on long edge with radiused corners on top side; without holes, cracks, or open seams.

2.03 SETTING MATERIALS

A. Manufacturers:
1. ARDEX Engineered Cements: www.ardexamericas.com.
2. Bostik Inc: www.bostik-us.com.
3. Custom Building Products: www.custombuildingproducts.com.
4. LATICRETE International, Inc: www.laticrete.com.
5. Mapei Corporation: www.mapei.com.
6. Merkrete, by Parex USA, Inc: www.merkrete.com/sle.
7. TEC, an H.B. Fuller Construction Products Brand: www.tecspecialty.com/#sle.
8. Substitutions: See Section 01 6000 - Product Requirements.

B. Provide setting materials made by the same manufacturer as grout.

C. Latex-Portland Cement Mortar Bond Coat: ANSI A118.4.
1. Applications: Use this type of bond coat where indicated and in thick-set applications.

D. Epoxy Adhesive and Mortar Bond Coat: ANSI A118.3.
1. Applications: Use bonding tile to steel substrates.

E. Organic Adhesive: ANSI A136.1, thinset mastic type.
1. Applications: Use for shower floors and walls.
2. Use Type I in areas subject to prolonged moisture exposure.

F. Dry-Set Portland Cement Mortar Bond Coat: ANSI A118.1.
1. Applications: Use in thin-set applications.

G. Mortar Bed Materials: Pre-packaged mix of Portland cement, sand, latex additive, and water.

2.04 GROUTS

A. Manufacturers:
1. ARDEX Engineered Cements: www.ardexamericas.com.

2. Bostik Inc: www.bostik-us.com.
3. Custom Building Products: www.custombuildingproducts.com.
4. LATICRETE International, Inc: www.laticrete.com.
5. Mapei Corporation: www.mapei.com
6. Merkrete, by Parex USA, Inc: www.merkrete.com/sle.
7. TEC, an H.B. Fuller Construction Products Brand: www.tecspecialty.com/#sle.
8. Substitutions: See Section 01 6000 - Product Requirements.

B. All grout lines shall be as narrow as possible.

C. Epoxy Grout: ANSI A118.3 chemical resistant and water-cleanable epoxy grout.
1. Applications: Provide at all locations.
2. Color(s): As selected by Architect from manufacturer's full line.

2.05 MAINTENANCE MATERIALS

A. Tile Sealant: Gunnable, silicone, siliconized acrylic, or urethane sealant; moisture and mildew resistant type.
1. Applications: Between tile and plumbing fixtures.
2. Color(s): As selected by Architect from manufacturer's full line.
3. Products:
a. ARDEX Engineered Cements: www.ardexamericas.com.
b. Custom Building Products: www.custombuildingproducts.com.
c. LATICRETE International, Inc: www.laticrete.com.
d. Mapei Corporation: www.mapei.com
e. Merkrete, by Parex USA, Inc: www.merkrete.com/sle.
f. Substitutions: See Section 01 6000 - Product Requirements.

B. Grout Sealer: Liquid-applied, moisture and stain protection for existing or new portland cement grout.
1. Composition: Water-based penetrating sealer.
2. Products: As recommended by the grout manufacturer.

2.06 ACCESSORY MATERIALS

A. Waterproofing Membrane: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.
1. Fluid or Trowel Applied Type:
a. Apply under all tile floors, and all floor penetrations including but not limited to floor drains and pipe penetrations as well as floor to wall intersections. Provide backer rod at floor to wall intersections and continue membrane 12" minimum up wall surface.
b. Thickness: 25 mils, minimum, dry film thickness.
c. Products:
1) Basis of Design: Custom Building Products; RedGard Crack Prevention and Waterproofing Membrane: www.custombuildingproducts.com; or products of one of the following manufactures:
2) ARDEX Engineered Cements: www.ardexamericas.com/#sle.
3) H.B. Fuller Construction Products Inc: www.tecspecialty.com/#sle.
4) LATICRETE International, Inc: www.laticrete.com/#sle.
5) Mapei Corporation: www.mapei.com
6) Merkrete, by Parex USA, Inc: www.merkrete.com/sle.
7) Substitutions: See Section 01 6000 - Product Requirements.

B. Reinforcing Mesh: 2 by 2 inch size weave of 16/16 wire size; welded fabric, galvanized.

C. Deep Cleaning of Existing Tile; where noted on the drawings.
1. Where tile or stone surfaces are scheduled to be "Deep Cleaned", provide a high-alkaline, two part industrial strength cleaner and degreaser for heavily soiled and neglected areas.

2. Products:
   a. Custom Building Products; Aqua Mix 1 & 2 Deep Clean: www.custombuildingproducts.com
   b. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.

C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of setting materials to sub-floor surfaces.

D. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within the following limits:
   1. Moisture Emission Rate: Not greater than 3 lb per 1000 sq ft per 24 hours, test in accordance with ASTM F1869.
   2. Alkalinity (pH): Verify pH range of 5 to 9, test in accordance with ASTM F710.

E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

D. Install backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to a feather edge.

E. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

3.03 INSTALLATION - GENERAL

A. Install tile and grout in accordance with applicable requirements of ANSI A108.1A thru A108.13, manufacturer's instructions, and TCNA (HB) recommendations.

B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.

E. Form internal angles square and external angles bullnosed.

F. Install ceramic accessories rigidly in prepared openings.

G. Install non-ceramic trim in accordance with manufacturer's instructions.

H. Install thresholds where indicated.

I. Sound tile after setting. Replace hollow sounding units.

J. Keep control and expansion joints free of mortar, grout, and adhesive.

K. Where wall or floor tile extends across EJ or CJ provide a 3/8" wide joint to align with the EJ or CJ and fill with sealant to match grout. All joints shall comply with the requirement set in the TCNA Handbook, EJ171 Movement Joint Guidelines for Ceramic, Glass and Stone.

L. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

M. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.

N. At changes in plane, inside corners, and tile-to-tile control joints, use sanded tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.04 INSTALLATION - FLOORS - THIN-SET METHODS

A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F113, dry-set or latex-Portland cement bond coat, with standard grout, unless otherwise indicated.
   1. Where waterproofing membrane is indicated, install in accordance with TCNA (HB) Method F122, with latex-Portland cement grout.

B. Install tile-to-tile floor movement joints in accordance with TCNA (HB) Method EJ171F.

3.05 INSTALLATION - FLOORS - MORTAR BED METHODS

A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F111, with cleavage membrane, unless otherwise indicated.
   1. Where waterproofing membrane is indicated, with standard grout or no mention of grout type, install in accordance with TCNA (HB) Method F121.

B. Waterproofing Membrane: Install as recommended by manufacturer .

C. Mortar Bed Thickness: 2 inch, unless otherwise indicated.

3.06 INSTALLATION - SHOWERS AND BATHTUB WALLS

A. At tiled shower receptors install in accordance with TCNA (HB) Method B420, mortar bed floor, and W245, thin-set over coated glass mat backer board walls.

B. Grout with latex-Portland cement grout.

3.07 INSTALLATION - WALL TILE

A. Over coated glass mat backer board on studs, install in accordance with TCNA (HB) Method W245.

B. Over gypsum wallboard on wood or metal studs install in accordance with TCNA (HB) Method W243, thin-set with dry-set or latex-Portland cement bond coat, unless otherwise indicated.
   1. Where mortar bed is indicated, install in accordance with TCNA (HB) Method W222, one coat method.
   2. Where waterproofing membrane is indicated other than at showers and bathtub walls, install in accordance with TCNA (HB) Method W222, one coat method.

C. Over interior concrete and masonry install in accordance with TCNA (HB) Method W202, thin-set with dry-set or latex-Portland cement bond coat.

3.08 CLEANING

A. Clean tile and grout surfaces.

3.09 PROTECTION

A. Do not permit traffic over finished floor surface for 4 days after installation.

3.10 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. See Section 01 7900 - Demonstration and Training, for additional requirements.

END OF SECTION

SECTION 09 5100
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Decorative Grid System Trim

C. Acoustical units.

1.02 RELATED REQUIREMENTS

A. Section 05 3100 - Steel Decking: Placement of special anchors or inserts for suspension system.

B. Section 07 2100 - Thermal Insulation: Acoustical insulation.

C. Section 08 3100 - Access Doors and Panels: Access panels.

1.03 REFERENCE STANDARDS

A. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2013.

B. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2017.

C. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2014.

D. CISCA (AC) - Acoustical Ceilings: Use and Practice; 1999.

E. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Do not install acoustical units until after interior wet work is dry.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate grid layout and related dimensioning, junctions with other ceiling finishes, and mechanical and electrical items installed in the ceiling.

C. Product Data: Provide data on suspension system components and acoustical units.

D. Samples: Submit two samples 6 by 6 inch in size illustrating material and finish of acoustical units.

E. Samples: Submit two samples each, 12 inches long, of suspension system main runner, cross runner, and perimeter molding.

F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

G. Manufacturer's certificate that products meet or exceed specified requirements.

H. Material Safety Data Sheets under provisions of Section 01 7800 - Closeout Submittals for the following items:
   1. All mastics, glues, and adhesives
   2. Acoustical ceiling tile

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.

2. Extra Acoustical Units: Quantity equal to 5 percent of total installed.

1.06 QUALITY ASSURANCE

A. Fire-Resistive Assemblies: Complete assembly listed and classified by UL for the fire resistance indicated.

B. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Installer Qualifications: An entity experienced in the installation of acoustical ceiling systems similar to requirements for this Project, and acceptable to, or licensed by, acoustical ceiling systems manufacturer.

E. Comply with the following standards:
1. CISCA (AC) "Acoustical Ceilings: Use and Practice."
2. CISCA (AC) "Guidelines for Seismic Restraint Direct Hung Suspended Ceiling Assemblies."

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01 6000 – Product Requirements.

B. Deliver acoustical ceiling system components in manufacturer's original unopened packages or containers, with labels intact.

C. Store all components to provide suitable protection against deleterious effects from exposure to moisture, direct sunlight, or other causes.

D. Handle all components to preclude damage. Take special precaution to prevent damage to acoustical ceiling unit edges and corners.

E. Comply with manufacturer's Material Safety Data Sheets (MSDS) for delivery, storage, and handling of components.

1.08 FIELD CONDITIONS

A. Maintain uniform temperature of 60 - 85 degrees F, and maximum relative humidity of 70 percent prior to, during, and after acoustical unit installation.

B. Prior to installation, the following conditions must exist:
1. All windows and exterior doors in place and roof watertight.
2. Work of all wet trades completed and thoroughly dried to installation of any system components.
3. Mechanical and Electrical trades shall have completed their work above ceiling line prior to acoustical ceiling systems installation. Coordinate with Mechanical and Electrical trades prior to start of installation.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. The manufacturer shall provide a minimum 15-year acoustical ceiling and suspension system warranty. Warranty shall warrant against ceiling tile sagging, warping and suspension grid rusting.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acoustic Tiles/Panels:
1. Armstrong World Industries, Inc: www.armstrongceilings.com.
2. CertainTeed Corporation: www.certainteed.com.
3. Rockfon, LLC: www.rockfon.com/#sle.

4. USG: www.usg.com.
5. Substitutions: See Section 01 6000 - Product Requirements.

B. Suspension Systems:
1. Same as for acoustical units.
2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ACOUSTICAL UNITS

A. Acoustical Tile Type L1 - Standard Panel: Painted mineral fiber, ASTM E 1264 Type III, Form 2, Sag Resistant Panels with the following characteristics:
1. Size: 24 by 24 inches.
2. Thickness: 5/8 inches.
3. Composition: Water felted.
4. Light Reflectance: Not less than 84 percent, determined in accordance with ASTM E1264.
5. NRC Range: Not less than 0.55, determined in accordance with ASTM E1264.
6. Ceiling Attenuation Class (CAC): Not less than 33, determined in accordance with ASTM E1264.
7. Edge: Square.
8. Surface Color: White.
9. Surface Pattern: CE (perforated, small holes and lightly textured)..
10. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical tiles treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold and mildew.
11. Products:
    a. Basis of Design: Fine Fissured HHF-157 as manufactured by Certainteed.
    b. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed in paragraph 2.01.
    c. Substitutions: See Section 01 6000 - Product Requirements.

B. Acoustical Panels Type L4 - Foodservice Panel: Vinyl faced gyp board, ASTM E 1264 Type IV, with the following characteristics:
1. Size: 24 by 24 inches.
2. Thickness: 1/2 inches.
3. Ceiling Attenuation Class (CAC): Not less than 34, determined in accordance with ASTM E1264.
4. Edge: Square.
5. Surface Color: White.
6. Surface Pattern: G (smooth texture).
7. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical tiles treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold and mildew.
8. Products:
    a. Basis of Design: Vinylrock 1142-CRF-1 as manufactured by Certainteed.
    b. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed in paragraph 2.01.
    c. Substitutions: See Section 01 6000 - Product Requirements.

C. Glass Fiber Acoustical Panels Type L6 – Acoustical “Absorptive” Panel: painted faced glass fiber, ASTM E 1264 Type XII, Form 2, Sag Resistant Panels with the following characteristics:
1. Size: 24 by 24 inches.
2. Thickness: 1-1/2 inches.
3. NRC Range: Not less than 1.00, determined as specified in ASTM E 1264.
4. Ceiling Attenuation Class (CAC): Not less than 25, determined in accordance with ASTM E1264.

5. Edge: Square.
6. Surface Color: White.
7. Surface Pattern: G (smooth texture).
8. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical tiles treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold and mildew.
9. Products:
    a. Basis of Design: Symphony F 1362-IOF-1 as manufactured byCertainteed.
    b. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed in paragraph 2.01.
    c. Substitutions: See Section 01 6000 - Product Requirements.

D. Glass Fiber Acoustical Panels Type L9 - Large Format Panel: Painted faced glass fiber, ASTM E 1264 Type XII, Form 2, Sag Resistant Panels with the following characteristics:
1. Size: 30 by 60 inches.
2. Size: 24 by 72 inches.
3. Thickness: 7/8 inches.
4. NRC Range: Not less than 0.85, determined as specified in ASTM E 1264.
5. Ceiling Attenuation Class (CAC): Not less than 35, determined in accordance with ASTM E1264.
6. Edge: Square.
7. Surface Color: White.
8. Surface Pattern: E (fine texture).
9. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical tiles treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold and mildew.
10. Products:
    a. Basis of Design: Symphony M 1228-85-1 as manufactured byCertainteed
    b. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed in paragraph 2.01.
    c. Substitutions: See Section 01 6000 - Product Requirements.

E. Glass Fiber Acoustical Panels Type L10 - Large Format Panel: Painted faced glass fiber, ASTM E 1264 Type XII, Form 2, Sag Resistant Panels with the following characteristics:
1. Thickness: 3/4 inches.
2. NRC Range: Not less than 0.75, determined as specified in ASTM E 1264.
3. Ceiling Attenuation Class (CAC): Not less than 40, determined in accordance with ASTM E1264.
4. Edge: Square.
5. Surface Color: White.
6. Surface Pattern: E (fine texture).
7. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical tiles treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold and mildew.
8. Products:
    a. Basis of Design: Symphony M 1229-75-1 as manufactured byCertainteed
    b. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed in paragraph 2.01.
    c. Substitutions: See Section 01 6000 - Product Requirements.

F. Acoustical Tile Type L11 - Standard High NRC Panel: Painted mineral fiber, ASTM E 1264 Type III, Form 2, Sag Resistant Panels with the following characteristics:
1. Size: 24 by 24 inches.
2. Thickness: 7/8 inches.

3. Composition: Water felted.
4. Light Reflectance: Not less than 83 percent, determined in accordance with ASTM E1264.
5. NRC Range: Not less than 0.75, determined in accordance with ASTM E1264.
6. Ceiling Attenuation Class (CAC): Not less than 35, determined in accordance with ASTM E1264.
7. Edge: Square.
8. Surface Color: White.
9. Surface Pattern: CE (perforated, small holes and lightly textured)..
10. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical tiles treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold and mildew.
11. Products:
    a. Basis of Design: Fine Fissured HHF-457 as manufactured by Certainteed.
    b. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed in paragraph 2.01.
    c. Substitutions: See Section 01 6000 - Product Requirements.

2.03 SUSPENSION SYSTEM(S)

A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with stabilizer bars, clips, splices, perimeter moldings, and hold down clips as required.

B. Exposed Steel Suspension System: Formed steel, commercial quality cold rolled; heavy-duty.
1. Profile: Tee; 15/16 inch wide face, main tee 1-1/2 inch, cross tee 1-1/2 inch.
2. Construction: Double web.
3. Finish: White painted.
4. Products:
    a. Basis of Design for Non-Fire Rated Assemblies – Ceiling Types I, II, V, VI, VII and IX: "Prelude XL Galvanized Capped" as manufactured by Armstrong World Industries
    b. Basis of Design for Non-Fire Rated Assemblies – Ceiling Types III, IV: "Prelude XL Aluminum Capped" as manufactured by Armstrong World Industries
    c. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed in paragraph 2.01. Ceiling Tile and Grid shall be as approved by the manufacturer.
    d. Substitutions: See Section 01 6000 - Product Requirements.

2.04 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application and ceiling system flatness requirement specified.
1. Angle Hangers: ASTM A 446 steel with G90 coating.
2. Flat Hangers: Zinc-coated steel.
3. Hanger Rods: Zinc-coated steel.

B. Perimeter Moldings: Same material and finish as grid.
1. At Exposed Grid: Provide L-shaped molding for mounting at same elevation as face of grid.

C. Decorative Grid System Trim
1. Physical properties.
    a. Extruded aluminum alloy 6063 trim channel, 10' straight or curved profiles.
    b. Concealed connections to grid with T-bar connection clip, including all necessary trim for corners inside and outside and all accessories.
    c. Size: 6 inch" wide face with 3/4" horizontal legs, straight or curved sections with special bosses formed for attachment to Axiom T-bar connection clip or hanging clip.
    d. Color: Match color of grid.

e. Finish: Factory-applied baked polyester paint.

2. Products:
   a. Basis of Design: Axiom, Classic Trim as manufactured by Armstrong World Industries.
   b. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed in paragraph 2.01.
   c. Substitutions: See Section 01 6000 - Product Requirements.

D. Acoustical Sealant For Perimeter Moldings: Non-hardening, non-skinning, for use in conjunction with suspended ceiling system.

E. Touch-up Paint: Type and color to match acoustical and grid units.

F. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.02 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with UL design requirements ASTM C 636/C 636M, ASTM E 580/E 580M, and manufacturer's instructions and as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.

D. Main runners directly suspended by minimum 12 gage galvanized steel wire; hanger wire wrapped tightly a minimum three full turns.
   1. Runner Spacing: 4’-0”.
   2. Hanger Spacing: 4’-0”.

E. Main runners interconnected by cross-tees to form modules as shown on reflected ceiling plans. Suitable cross-tee lengths adjacent to recessed light fixtures on each side not supported by a main runner.
   1. Cross-Tee Spacing: 4’-0”.

F. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.

G. Provide hanger clips during steel deck erection. Provide additional hangers and inserts as required.

H. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

I. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

J. Do not eccentrically load system or induce rotation of runners.

K. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Use longest practical lengths.
   2. Overlap and rivet corners.

L. Add extra ceiling wire at each corner of light fixtures and grilles.

M. Fire rated main runner/cross runner fire expansion relief cutout shall be evaluated for load performance where field application requires the expansion relief to be designed more than 3” from the closest support point.

N. Form expansion joints as detailed. Form to accommodate plus or minus 1 inch movement. Maintain visual closure.

3.03 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Install acoustical ceiling units from a three-carton mix to obtain uniform distribution of surface variations.

D. Fit border trim neatly against abutting surfaces.

E. Install units after above-ceiling work is complete.

F. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

G. Cutting Acoustical Units:
   1. Cut to fit irregular grid and perimeter edge trim.
   2. Make field cut edges of same profile as factory edges.

H. Sound walls: Set acoustical ceiling boards in four continuous beads of 1/4" diameter sealant, one at top of each edge of the gypsum drywall and two on top of the top metal runner track.

I. Install hold-down clips on each panel to retain panels tight to grid system at rated assemblies; comply with fire rating requirements.

3.04 ADJUSTMENTS

A. Make adjustments in ceiling system as necessary to ensure compliance with this specification.

B. Remove and replace damaged or soiled acoustical ceiling units.

3.05 CLEANING

A. Remove debris which may have been caused during installation of this work.

B. In addition to other stipulated requirements for cleaning, completely remove fingerprints and traces of soil from the surfaces of grid and acoustical materials, using only those cleaning materials recommended for the purpose by the manufacturer of the material being cleaned.

END OF SECTION

SECTION 09 5426
LINEAR WOOD WALL AND CEILING SYSTEM

PART 1 – GENERAL

1.01 SECTION INCLUDES:

A. Concealed suspension system for Linear Wood Wall and Ceiling Systems.

B. Linear Wood Wall and Ceiling Panels

C. Trim and accessories.

D. Edges, Border and Perimeter Trims.

1.02 RELATED WORK IN OTHER SECTIONS:

A. Division 1 – “General Conditions” for substitution requests, submittals, etc.

B. Division 9 – “Acoustic Ceilings.”

C. Division 15 – “Mechanical” for work to be coordinated with ceiling.

D. Division 16 – “Electrical” for light fixture coordination.

1.03 REFERENCES

A. ASTM A 641: Standard Specification for Zinc Coated (Galvanized) Carbon Steel Wire; 1992.

B. ASTM C 423: Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 1990.

C. ASTMC C 635: Standard Specifications for Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings.

D. ASTM C 636: Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels; 1992.

E. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials; 1991.

F. ASTM E 580: Standard Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Seismic Restraint; 1991.

G. AWI (QSI): Architectural Woodwork Quality Standards Illustrated; 2003.

H. CISCA: Ceiling Systems Handbook.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer, approved by wood wall and ceiling manufacturer, who has completed panel walls and ceilings similar in species, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Inspection: All work must pass inspection and approval of architect, as well as the local codes and regulations or authorities having jurisdiction.

C. Single-Source Responsibility for Wood Wall and Ceiling System: Obtain each type of Linear Wood Wall and Ceiling Panels from a single fabricator, with in-house Shop Drawing capabilities, in-house assembly and finishing capabilities, and with resources to provide products of consistent quality in appearance and physical properties without delaying the project.

D. Single-Source Responsibility for Suspension System: Obtain each type of suspension system from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying project.

E. Pre-Installation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings."

1.05 SUBMITTALS

A. General: Submit each item in this Section according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data: For each type of product specified.

C. Samples: For verification of each type of exposed finish required, prepared on samples of size indicated below. Where finishes involve normal color and texture variations, include sample sets showing the range of variations expected.
   1. 12” x 18” samples of each panel type, pattern, and color.

1.06 SHOP DRAWINGS & COORDINATION WITH OTHER TRADES

A. Shop Drawings: Provide Shop Drawings/Coordination Drawings for all walls and ceilings, which should include interior elevations, RCP and product details. Coordinate Linear Wood wall and ceiling panels layout and installation of wood panels and suspension system components with other construction elements that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system components, partition assemblies and all perimeter conditions.

1.07 PROJECT CONDITIONS

A. Space Enclosure and Environmental Limitations: Do not install wood panel wall and ceilings until spaces are enclosed and weatherproof, wet-work in spaces is completed and dry, work above ceilings is complete, and ambient temperature and humidity conditions are being maintained at the levels indicated for Project when occupied for its intended use.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Delivery & Unloading: Coordinate crate sizes, weights, unloading options, and delivery schedule with manufacturer prior to fabrication. Deliver wood panels and suspension system components to Project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other mistreatment.

B. Acclimatization: Before installing wood panels, permit them to reach room temperature and a stabilized moisture content (at least 72 hours) per AWI standards.

C. Handling: Handle Linear Wood Wall and Ceiling Panels carefully to avoid chipping edges or damaging units in any way.

D. Protection:
   1. Personnel: Follow good safety and industrial hygiene practices during handling and installing of all products and systems, with personnel to take necessary precautions and wear appropriate protective equipment as needed. Read related literature for important information on products before installation. Contractor to be solely responsible for all personal safety issues during and subsequent to installation; architect, specifier, owner, and manufacturer will rely on contractor’s performance in such regard.
   2. Existing completed work: Protect completed work above suspension system from damage during installation of suspension system components.

1.09 EXTRA MATERIALS

A. Extra Materials: Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.
   1. Linear Wood Wall and Ceiling Panels: Furnish quantity of full-size units equal to 2.0 percent of amount installed.
   2. Suspension System Components: Furnish quantity of each component equal to 2.0 percent of amount installed.

1.10 WARRANTIES

A. Warranties: Provide owner with a (1) year warranty for material and workmanship on all installed products.
   1. Manufacturers: All materials, wood wall, ceiling and grid, shall be warranted for (1) one year for material and workmanship.
   2. Installer: All work shall be warranted for (1) year from final acceptance of completed work.

PART 2 – PRODUCTS

2.01 MANUFACTURES

A. 9Wood, Inc.: www.9wood.com

B. CertainTeed Corporation: www.certainteed.com.

C. Architectural Components Group Inc / Armstrong: www.armstrongceilings.com

D. Hunter Douglas: www.hunterdouglasarchitectural.com

E. Rulon International: www.rulonco.com

F. Substitutions: See Section 01 6000 - Product Requirements.

2.02 LINEAR WOOD WALL AND CEILING PANELS - LCS01/LWS01

A. Basis of Design: AGCI / Armstrong Encore Series 1 Acoustical Wood System.
   1. Wood Panels: Model EN1-7500-C8
      a. Species: As scheduled.
      b. Member Size: 7.5" x 3/4" Wide Planks with 8mm Groove Spacing.
      c. Edge Condition: T&G edge on long sides, grooves & grain direction running parallel to the long dimension.
      d. Reveal: Acoustic Infill Panel
      e. Assembly Style: Per Manufacturer Recommendations
      f. Fire Rating: Class 1(A) Fire Rating
      g. Finish: As indicated in the drawings.

2.03 LINEAR WOOD WALL AND CEILING PANELS - LCS02

A. Basis of Design: Certainteed Wood Ceilings and Walls Linear Planks.
   1. Wood Panels: Model
      a. Species: As scheduled.
      b. Plank Width (Nominal): 6"
      c. Reveal Width (Actual): 3/4 inch.
      d. Open Reveal Type: Felt.
      e. Assembly Style: Per Manufacturer Recommendations
      f. Fire Rating: Class 1(A) Fire Rating
      g. Finish: As indicated in the drawings.

2.04 FINISHES AND COLORS

A. All Linear Wood Wall and Ceiling Panels shall be factory-finished with clear sealers, wood stains, or semi-transparent color treatments as selected. All finishes shall be selected by the designer, architect, or designated owner's representative.

B. Wood is a natural product with variations in grain, texture, and color - often ranging from light to dark - thereby, affecting the surface look. Product finishes shall be stain or sealer coats, spray-applied to a smooth-sanded surface.

2.05 SUSPENSION SYSTEMS FOR WALL PANELS

A. Linear Wood Panels shall be installed using ‘Z’ clips or direct screw method.

2.06 EDGES, BORDERS, AND PERIMETER TRIMS

A. Edges, borders, and perimeter trims, shall be designated by specifier in accordance with standard design details available. All wood wall products specified shall be supplied by the panel manufacturer.

2.07 METAL SUSPENSION SYSTEMS FOR CEILING PANELS, GENERAL

A. Metal T-Grid Suspension System: Provide standard interior Metal Heavy Duty 15/16" suspension T-Grid system using Main Runners, Cross-tees, Wall Angle or Shadow Moldings of types, structural classifications, and black finishes indicated and that comply with applicable ASTM C 635 requirements. Comply with all applicable seismic codes and ordinances.

B. Attachment Devices: Size for 3 times the design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.

C. Wire, Braces, Ties, Hanger Rods, Flat Hangers and Angle Hangers: Provide wires, rods and hangers that comply with applicable ASTM specifications.

PART 3 – EXECUTION

3.01 EXAMINATION

A. General: Examine substrates and structural framing to which walls and ceilings attach or abut, with installer present, for compliance with requirements specified in this and other sections that affect ceiling installation and anchorage. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other ceiling anchors whose installation is specified in other Sections.

B. Layout: Measure each ceiling area and establish the layout of Linear Wood Wall and Ceiling Panels to balance widths at opposite edges of each wall and ceiling. Avoid using less-than-half-width panels at borders, and conform to the layout shown on elevations and reflected ceiling plans in accordance with wood ceiling manufacturer's approved Shop Drawings.

3.03 INSTALLATION

A. General: Install interior linear system to comply with manufacturer's instructions and CISCA "Ceiling Systems Handbook."

B. Wall Panel Attachment: Linear Wood Wall Panels shall be installed to furring strips by using either direct screw or 'Z' clips.

C. Ceiling Panel Attachments: Suspend ceiling hangers from building's structural members per manufacturer's instructions and in compliance with all local codes and regulations.

D. Installation of Metal T-Bar Grid: Install, align, brace, tie-off, mount, handle interferences, and space suspension T-Grid in accordance with suspension manufacturer's instructions and in compliance with all local codes and regulations.

E. Installation of linear wood wall and ceiling: Install Linear Wood wall and ceiling panels in accordance with manufacturer's installation instructions and in compliance with all local codes and regulations. Install with undamaged edges and fitted accurately to suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit, as required.

F. Suspension Runners: Install suspension system runners so they are square and securely interlocked with one another. Install number and use on-center spacing per wood ceiling manufacturer's instructions, as indicated on approved Shop Drawings and in compliance with all local codes.

3.04 ADJUSTMENT, CLEANING AND REPAIR

A. General: Clean exposed wood surfaces of linear wood wall and ceiling panels. Comply with manufacturer's instructions for cleaning and touchup of minor finish damage. Remove and replace wood ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

B. The contractor shall make final adjustments to level or contours at wood wall panel locations.

3.05 INSPECTION

A. Upon completion of installation, the owner's representative shall inspect all finished surfaces to ensure that work has been performed in a manner satisfactory to the owner. Any deficiencies in the installed wall shall be corrected by the contractor at no additional cost to the owner, or to the wall panel manufacturer.

END OF SECTION 09 5426

SECTION 09 6433
LAMINATED WOOD FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Laminated wood flooring.

B. Installation accessories.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood subfloor surface.

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, wood species and colors available; and installation instructions.

C. Shop Drawings: Indicate floor joint pattern and termination details.

D. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.06 FIELD CONDITIONS

A. Do not install wood flooring until wet construction work is complete and ambient air at installation space has moisture content stabilized at maximum moisture content of 40 percent.

B. Provide heat, light, and ventilation prior to installation.

C. Store materials in area of installation for minimum period of 24 hours prior to installation.

D. Maintain minimum room temperature of 65 degrees F and relative humidity in accordance with adhesive manufacturer's instructions for a minimum period of 48 hours prior to delivery of materials to installation space, during installation, and after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Laminated Wood Flooring:
   1. Armstrong World Industries, Inc: www.armstrong.com/#sle.
   2. Mannington Commercial: www.mannington.com/commercial/#sle.
   3. Nydree Flooring: www.nydreeflooring.com/#sle.
   4. Substitutions: Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Laminated Wood Flooring:
   1. Basis of design: Engineered Acrylic Infused Wood Flooring manufactured by Nydree Flooring.
   2. Construction: Tongue and groove, end-matched laminated wood planks.

3. Installation Method: Glued down.
4. Fire Rating: ASTM E648, Class II.
5. Slip Resisitance Index: 0.73" Dry and 0.47" wet when tested in accordance with ASTM F2508/Dynamic.
6. Surface Burning Characteristics: Flame Spread Index of 200, maximum; Smoke Developed Index of 450, maximum; when tested in accordance with ASTM E84.
7. Species: As scheduled on the drawings.
8. Infused Color: As scheduled on the drawings.
9. Thickness: .430 inch.
10. Width: 2-2/3 and 4 inch. See drawings for locations.
11. Edge Profile: Micro-beveled..
12. Length: Random, minimum of 9 inches.
13. Treatment: Acrylic impregnated.
14. Finish: Pedestrian 2.0 15-20 gloss.

2.03 ACCESSORIES

A. Sound Control Underlayment: Felt type.
   1. Thickness: 15lb nominal.

B. Adhesives: All-in-one moisture retarder and adhesive solution recommended by flooring manufacturer.
   1. Provide high-end, formaldehyde-free, lamination glue to firmly hold wear layer to plywood core.

C. Transition Strip: Same species and finish as flooring material; provide at all doors and opening to adjacent rooms.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within the tolerances required for type of substrate and ready to receive laminated wood flooring.

B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of materials to substrate surface.

C. Verify that concrete sub-floor surfaces are ready for wood flooring installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are outside the limits recommended by adhesive materials manufacturer.

3.02 PREPARATION

A. Prepare subfloor in accordance with flooring manufacturer's and NWFA installation instructions.

B. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.

C. Prohibit traffic until filler is fully cured.

D. Vacuum clean substrate.

3.03 INSTALLATION

A. Underlayment: Install in accordance with manufacturer's installation instructions.

B. Adhesives: Install in accordance with adhesive manufacturer's installation instructions.
   1. Remove excess adhesive extruded through floor surface as work progresses.

C. Wood Flooring:
   1. Install flooring in accordance with manufacturer's and NWFA installation instructions.
      a. Glue down over concrete or approved underlayment/subfloor.

3.04 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damaging surfaces.

B. Clean floor surfaces in accordance with the flooring manufacturer's instructions.

3.05 PROTECTION

A. Prohibit traffic on finished floor for 24 hours after installation.

B. Place protective coverings over finished floors; do not remove coverings until after Date of Substantial Completion.

END OF SECTION

SECTION 09 6500
RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient tile flooring including layered vinyl tile.

B. Resilient base.

C. Resilient stair accessories.

D. Installation accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors.

1.03 REFERENCE STANDARDS

A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2017.

B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2017.

C. ASTM F1700 - Standard Specification for Solid Vinyl Floor Tile; 2013a.

D. ASTM F2169 - Standard Specification for Resilient Stair Treads; 2015, with Editorial Revision (2016).

E. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2015.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Verification Samples: Submit two samples, 12 by 12 inch in size illustrating color and pattern for each resilient flooring product specified.

D. Concrete Testing Standard: Submit a copy of ASTM F710.

E. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of sub-floor is acceptable.

F. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. All attic stock to be placed on pallets, shrink-wrapped, and clearly marked with campus. Attic stock to be delivered to TISD Warehouse, with transmittal, and verified with Owner upon delivery. Owner-signed transmittal to be included in close-out documents.
   3. Extra Flooring Material: 2% of each type and color.
   4. Extra Wall Base: 2% of each type and color.
   5. Extra Stair Materials: Quantity equivalent to 2% of each type and color.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum three years experience.

B. Installer Qualifications: Company specializing in installing specified flooring with minimum three years experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

D. Do not double stack pallets.

1.07 FIELD CONDITIONS

A. Maintain temperature in storage area between 65 degrees F and 85 degrees F.

B. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 65 degrees F.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Submit a written warranty, executed by the Contractor, Installer, and Manufacturer, agreeing to repair or replace flooring that fails in materials or workmanship within the specified warranty period.
   1. Warranty Period: One (1) year after date of Substantial Completion.

PART 2 PRODUCTS

2.01 TILE FLOORING

A. Vinyl Tile (LVT): Printed film type, with transparent or translucent wear layer.
   1. Manufacturers:
      a. Mannington Mills, Inc: www.mannington.com.
      b. Substitutions: See Section 01 6000 - Product Requirements.
   2. Minimum Requirements: Comply with ASTM F1700, of Class corresponding to type specified.
   3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or ASTM E 648.
   4. Tile Size: As scheduled.
   5. Wear Layer Thickness: 0.030 inch. (30 mil.)
   6. Total Thickness: 0.125 inch.
   7. Product/Color/Pattern: Refer to Schedule of Materials and Colors.

2.02 STAIR COVERING

A. Stair Treads: Rubber; full width and depth of stair tread in one piece; tapered thickness.
   1. Manufacturers:
      a. Burke Flooring: www.burkeflooring.com.
      b. Flexco, Inc: www.flexcofloors.com.
      c. Johnsonite, a Tarkett Company: www.johnsonite.com.
      d. Roppe Corp: www.roppe.com.
      e. Substitutions: See Section 01 6000 - Product Requirements.
   2. Minimum Requirements: Comply with ASTM F2169, Type TS, rubber, vulcanized thermoset.
   3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or ASTM E 648.
   4. Nominal Thickness: 0.250 inch.
   5. Nosing: Square.

6. Color: To be selected by Architect from manufacturer's full range.

2.03 RESILIENT BASE

A. Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; top set Style B, Cove. Provide straight base where indicated.
   1. Manufacturers:
      a. Burke Flooring: www.burkeflooring.com.
      b. Flexco, Inc: www.flexcofloors.com.
      c. Johnsonite, a Tarkett Company: www.johnsonite.com.
      d. Roppe Corp: www.roppe.com.
      e. Substitutions: See Section 01 6000 - Product Requirements.
   2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or ASTM E 648.
   3. Height: 2.5 and 4 inch. See drawings for locations.
   4. Thickness: 0.125 inch.
   5. Length: Roll.
   6. Color: Refer to Section 01 6210 Schedule of Materials and Colors.
   7. Accessories: Premolded external corners where return is 3" or less.

2.04 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Adhesives
   1. Provide only high moisture and alkali tolerant type adhesive as recommended by the manufacturer of the material being installed.
   2. Asphalt emulsions and other non-waterproof adhesives will not be acceptable.
   3. Contact manufacturer for recommended adhesive if pH levels exceed 9 or MVER exceeds 5 pounds.

C. Where the moisture-vapor-emission rate exceeds the manufacturers allowable rate provide and install a moisture mitigating primer as reccommended by the manufacturer.

D. Moldings, Transition and Edge Strips: Vinyl products by same manufacturer as Resilient Base.
   1. Product: Profile equal to "Tile-Carpet Joiner #150" manufactured by Burke Flooring.

E. Sealer and Wax: Types recommended by flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

C. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for resilient flooring installation by testing for moisture and pH.
   1. Test in accordance with ASTM F710.

D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Clean substrate.

C. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.

3.03 INSTALLATION - GENERAL

A. Install in accordance with manufacturer's written instructions.

3.04 INSTALLATION - TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

B. Lay flooring with joints and seams parallel to building lines to produce symmetrical pattern.

C. Install tile to pattern as indicated. Allow minimum 1/2 full size tile width at room or area perimeter.

3.05 INSTALLATION - RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

B. Miter internal corners. At external corners, 'V' cut back of base strip to 2/3 of its thickness and fold. At returns of 3" or less, use premolded units.

C. Install base on solid backing. Bond tightly to wall and floor surfaces.

D. Scribe and fit to door frames and other interruptions.

E. Provide continuous sealant at top of base in all Foodservice areas inluding kitchens, food storage, serving lines, etc. Color as selected by Architect.

3.06 INSTALLATION - STAIR COVERINGS

A. Install stair coverings in one piece for full width and depth of tread.

B. Adhere over entire surface. Fit accurately and securely.

3.07 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean, seal, and wax in accordance with manufacturer's written instructions.
   1. LVT: Initial Maintenance and Preparation for Commercial Traffic
      a. Sweep, dust mop or vacuum the floor thoroughly to remove all loose dust, dirt, grit and debris.
      b. Remove any dried adhesive residue with a clean, white cloth dampened with mineral spirits, carefully following warnings on the container.
      c. Damp mop the floor with a properly diluted neutral (pH 6 to 8) detergent solution such as Armstrong S-485 Commercial Floor Cleaner.
      d. If necessary, scrub the floor using a rotary machine or auto scrubber with a properly diluted neutral detergent solution such as Armstrong S-485 Commercial Floor Cleaner and the appropriate scrubbing brush (aggressiveness equivalent to 3M red pad for light scrub, 3M blue pad or equal for a deep scrub).
      e. Thoroughly rinse the entire floor with fresh, clean water. Remove rinse water and allow the floor to dry completely.

3.08 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

B. Protect installed flooring as recommended by the flooring manufacturer against damage from rolling loads, other trades, or the placement of fixtures and furnishings.

C. If it becomes necessary to move any heavy fixtures or appliances over the flooring on casters or dollies, the flooring should be protected with 1/4" or thicker plywood, hardboard or other underlayment panels. If other on-site work is continuing, use a protective covering such as plain, undyed kraft paper to guard against damage to the new floor.

END OF SECTION

SECTION 09 6566
RESILIENT ATHLETIC FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fluid-applied polyurethane flooring over rubberized base mat.

B. Painted game lines.

C. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors.

1.03 REFERENCE STANDARDS

A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).

B. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2015 (Reapproved 2021).

C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2017.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed data sheets for products specified.

C. Shop Drawings: Fabrication and installation details, and layout, colors, and widths of game lines and equipment locations.

D. Verification Samples: Actual flooring material specified, not less than 12 inch square, mounted on solid backing.
   1. Include samples of game lines, illustrating colors selected.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. Minimum ten (10) years experience in manufacturing of specified flooring.

B. Installer Qualifications: An experienced installer certified in writing by the flooring manufacturer to be qualified for installation of specified flooring system.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in unopened containers clearly labeled with manufacturer's name and identification of contents.

B. Store materials in dry and clean location until needed for installation. During installation, handle in a manner that will prevent marring and soiling of finished surfaces.

1.07 FIELD CONDITIONS

A. Maintain temperature in spaces to receive adhesively installed resilient flooring within range of 70 to 95 degrees F for not less than 48 hours before the beginning of installation and for not less than 48 hours after installation has been completed. Subsequently, do not allow temperature in installed spaces to drop below 50 degrees F or to go above 100 degrees F.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Submit a written warranty, executed by the Contractor, Installer, and Manufacturer, agreeing to repair or replace flooring that fails in materials or workmanship within the specified warranty period.
   1. Warranty Period: One (1) year after date of Substantial Completion.

PART 2 PRODUCTS

2.01 FLUID-APPLIED ATHLETIC FLOORING

A. Manufacturers: All products by the same manufacturer.
   1. Connor Sports Flooring: www.connorfloor.com/#sle.
   2. Dynamic Sports Construction Inc: www.dynamicsportsconstruction.com/#sle.
   3. Robbins Sports Surfaces: www.robbinsfloor.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Polyurethane Flooring Over Rubberized Base Mat:
   1. Basis of Design; Product: Elasti-Plus 7+2 manufactured by Connor Sports Flooring.
   2. Base Mat: Prefabricated rubber mat of recycled rubber granules in polyurethane binder.
   3. Sealer: Manufacturer's standard two-component polyurethane compound designed to seal base mat before application of resin topcoat.
   4. Resin: Two-component, solid, pigmented, self-leveling polyurethane without fillers, zero mercury formulation, with properties as follows:
      a. Tensile strength: Minimum 3000 psi, per ASTM D412.
      b. Durometer Hardness, Type A: Minimum of 81, when tested in accordance with ASTM D2240.
      c. Ultimate Elongation: Minimum 200 percent, per ASTM D412.
   5. Finish: Manufacturer's standard pigmented two-component polyurethane topcoat, matte finish, in color as scheduled.
   6. Color: Refer to Schedule of Materials and Colors.

C. Game Lines: Manufacturer's standard pigmented polyurethane paint.
   1. Colors: As selected by Architect. Refer to Schedule of Materials and Colors.

2.02 ACCESSORIES

A. Leveling Compound: Latex-modified cement formulation as recommended by flooring manufacturer for substrate conditions.

B. Flooring Adhesive: Waterproof; types recommended by flooring manufacturer.

C. Where the moisture-vapor-emission rate exceeds the manufacturers allowable rate provide and install a moisture mitigating primer as reccommended by the manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates for conditions detrimental to installation of athletic flooring. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of athletic flooring to substrate.

C. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for resilient flooring installation by testing for moisture and pH.
   1. Test in accordance with ASTM F710.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Remove coatings that are incompatible with flooring adhesives, using methods recommended by flooring manufacturer.

C. Broom clean areas to receive athletic flooring immediately before beginning installation.

3.03 INSTALLATION

A. Comply with manufacturer's recommendations and approved shop drawings.

B. Fluid-Applied Polyurethane Flooring Over Base Mat:
   1. Mix components in strict accordance with manufacturer's written instructions, and apply at manufacturer's recommended rates. Allow sufficient curing time between coatings.
   2. Unroll base mat and allow to relax before beginning installation.
   3. Apply adhesive to substrate with notched trowel, and roll base mat into fresh adhesive. Do not allow compression fit at any seams. Roll mat with weighted linoleum roller immediately upon application of base mat and again after 45 minutes to insure that base mat is firmly adhered to substrate.
   4. Thoroughly mix and apply seal coat to surface of base mat with steel trowel.
   5. Apply resin wear layer in number of lifts recommended by manufacturer, applying wet-into-wet to achieve a seamless surface. Sand any imperfections in surface after wear layer has cured.
   6. Thoroughly mix and apply finish coat with airless sprayer to achieve uniform appearance.
   7. Lay out game lines using tape and taping machine approved by flooring manufacturer. Apply game line paint with roller, and allow to dry before removing tape.

3.04 CLEANING

A. Clean flooring using methods recommended by manufacturer.

3.05 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

B. Protect finished athletic flooring from construction traffic to ensure that it is without damage upon Date of Substantial Completion.

C. If it becomes necessary to move any heavy fixtures or appliances over the flooring on casters or dollies, the flooring should be protected with 1/4" or thicker plywood, hardboard or other underlayment panels. If other on-site work is continuing, use a protective covering such as plain, undyed kraft paper to guard against damage to the new floor.

END OF SECTION

SECTION 09 6816
SHEET CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Carpet, direct-glued.

B. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied carpet.

1.03 REFERENCE STANDARDS

A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2017.

B. CRI 104 - Standard for Installation of Commercial Carpet; 2018.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate seaming plan, method of joining seams, direction of carpet pile and pattern, location of edge moldings and edge bindings.

C. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

D. Samples: Submit three samples 12 by 12 inch in size illustrating color and pattern for each carpet material specified.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

F. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.
   1. Instruct the owner's personnel in the care and maintenance of the flooring. Instruction and maintenance shall be performed by the flooring subcontractor and a representative of the flooring manufacturer. Refer to Section 01 7800 - Closeout Documents for additional requirements and information.
   2. The demonstration shall include written guidelines for the proper equipment, operation, materials and manufacturers recommended schedule of maintenance. See Section 01 7900 - Demonstration and Training for additional information.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional requirements.
   2. All attic stock to be placed on pallets, shrink-wrapped, and clearly marked with campus. Attic stock to be delivered to TISD Warehouse, with transmittal, and verified with Owner upon delivery. Owner-signed transmittal to be included in close-out documents.
   3. Extra Carpet: Quantity equal to 2 percent of total installed of each color and pattern installed.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet with minimum five years documented experience.

B. Installer Qualifications: Company specializing in installing carpet with minimum five years documented experience.

1.06 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

B. Maintain minimum 70 degrees F ambient temperature 24 hours prior to, during and 24 hours after installation.

C. Ventilate installation area during installation and for 72 hours after installation.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Submit a written warranty, executed by the Contractor, Installer, and Manufacturer, agreeing to repair or replace tile that fails in materials or workmanship within the specified warranty period.
   1. Warranty Period: One (1) year after date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Carpet:
   1. Tarkett USA: www.commercial.tarkett.com.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 CARPET

A. Carpet:
   1. Product Line / Color: See Schedule of Materials and Colors.
   2. Fiber Characteristics
      a. Fiber: Bulked Continuous Filament (BCF) Nylon in a loop pile construction TDX Nylon.
      b. Static Control: Fiber to contain carbon-core filament. Topical treatments are not acceptable.
      c. Stain Inhibitor: Applied to the fiber during product manufacturing to resist fiber staining and soiling.
   3. Cushion Characteristics
      a. Primary Backing: Synthetic Non-Woven.
      b. Secondary Backing: Powerbond Closed Cell Cushion
         1) Product Size: 6-Foot Wide Roll Goods.
         2) Cushion Type: Closed Cell Cushion.
         3) Cushion Thickness: .156 inch.
         4) Cushion Density (ASTM D1667): Min. 18.5 lbs/cu ft.
         5) Compression Set (ASTM D1667): Maximum 10%.
         6) Compression Force Deflection (ASTM D1667): Minimum 7 lbs/sq. inch @ 25%; Maximum 25 lbs/sq. inch at 25%.
         7) Moisture Barrier: Impermeable to moisture and airflow. Moisture Penetration by Impact @ 10 psi: No penetration of backing after 10,000 impacts. Provide independent test results. The British Spill Test is NOT an acceptable measurement for moisture barrier.
         8) Seam Method: Chemical weld; molecularly bound seams to be impermeable to moisture and airflow
         9) Seam Integrity: Moisture Penetration by Impact at SEAMS @ 10 psi; No penetration after 10,000 impacts. Provide independent test results. The British Spill Test is NOT an acceptable measurement for moisture barrier.
         10) Seam Integrity: Phillips Chairs Test: No seam separation after 50,000 cycles; Provide independent test results
         11) Face yarn fully fused to secondary backing system that will not delaminate
         12) Delamination: No delamination per ASTM D3936

13) Product must not contain pesticides (US EPA Registered Antimicrobials). Installation adhesives are exempt from this section.

B. Carpet: Walk-Off Matt
   1. Product Line / Color: See Schedule of Materials and Colors.
      a. Backing: Powerbond Closed Cell Cushion
      b. Construction: Accuweave® Patterned Loop
      c. Gauge: 1/12
      d. Stitch Rate: 8.0 / inch
      e. Tuft Density: 96.0 tufts/sq inch
      f. Pile Height Average: .187 inch
      g. Pile Thickness: .115 inch
      h. Density Factor (UM44D): 7,513 oz/cu yd
      i. Fiber System: TDX BCF Nylon with Static Control & Ensure
      j. Dye Method: 100% Solution Dyed
      k. R-Value: 0.84 Hr-ft2-ºF/Btu
      l. Static Coefficient of Friction: ASTM C-1028; Passes ADA requirements.
      m. Static Propensity: AATCC 134: 3.5 kv or less
      n. Flooring Radiant Panel: ASTM E-648 or NFPA 253: Class 1
      o. Acoustic Requirements: Noise Reduction Coefficient (NRC): 0.22 Minimum
      p. Seam Integrity: No seam separation after 50,000 cycles per Phillips Chair Test
      q. Cushion Compression Set: Maximum 10%
      r. Cushion Compression Force Deflection: Minimum 7 lbs/sq. inch @ 25%; Maximum 25 lbs/sq. inch at 25%
      s. Cushion Density 18.5 lbs per cubic foot
      t. Cushion Thickness: 0.156 inch
      u. Total Weight: 85 oz/sq yd +/- 5%
      v. Environmental Impact: No pesticides added to product (US EPA Registered Antimicrobials)

2.03 ACCESSORIES

A. Sub-Floor Filler: Type recommended by carpet manufacturer.

B. Edge Strips: Vinyl, color as selected.

C. Adhesives:
   1. Provide only high moisture and alkali tolerant type adhesive as recommended by the manufacturer of the material being installed.
   2. Contact manufacturer for recommended adhesive if pH levels exceed 9 or MVER exceeds 5 pounds.
   3. Asphalt emulsions and other non-waterproof adhesives will not be acceptable.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive carpet.

B. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of adhesives to sub floor surfaces.

C. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for flooring installation by testing for moisture and alkalinity (pH).
   1. Test in accordance with ASTM F710.
   2. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.

D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler.

C. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.

D. Clean substrate.

3.03 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of sub-floor conditions.

B. Install carpet and cushion in accordance with manufacturer's instructionsand CRI 104 (Commercial).

C. Verify carpet match before cutting to ensure minimal variation between dye lots.

D. Lay out carpet and locate seams in accordance with shop drawings.
   1. Locate seams in area of least traffic, out of areas of pivoting traffic, and parallel to main traffic.
   2. Do not locate seams perpendicular through door openings.
   3. Align run of pile in same direction as anticipated traffic and in same direction on adjacent pieces.
   4. Locate change of color or pattern between rooms under door centerline.
   5. Provide monolithic color, pattern, and texture match within any one area.

E. Install carpet tight and flat on subfloor, well fastened at edges, with a uniform appearance.

3.04 DIRECT-GLUED CARPET

3.05 CLEANING

A. Remove excess adhesive from floor and wall surfaces without damage.

B. Clean and vacuum carpet surfaces.

C. Provide a heavy non-staining paper or plastic walkway as required over carpeting in direction of traffic, maintaining intact until carpeted space is accepted by the Owner.

3.06 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

END OF SECTION

SECTION 09 7200
WALL COVERINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation .

B. Wall covering .

1.02 REFERENCE STANDARDS

A. ASTM D1308 - Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Coating Systems; 2020.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on wall covering and adhesive.

C. Shop Drawings: Indicate wall elevations with seaming layout.

D. Samples: Submit two samples of wall covering, 6 x 6 inch in size illustrating color, finish, and texture.

E. Test Reports: Indicate verification of flame and smoke ratings, when tested by UL.

F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

G. Maintenance Data: Submit data on cleaning, touch-up, and repair of covered surfaces.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Wall Covering Materials: 25 linear feet of each color and pattern of wall covering; store where directed.
   3. Package and label each roll by manufacturer, color and pattern, and destination room number.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum three years of experience.

B. Installer Qualifications: Company specializing in performing the type of work specified in this section with minimum three years of experience.

1.05 MOCK-UP

A. Locate where directed.

B. Mock-up may remain as part of the Work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Inspect roll materials at arrival on site, to verify acceptability.

B. Protect packaged adhesive from temperature cycling and cold temperatures.

C. Do not store roll goods on end.

1.07 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the adhesive or wall covering product manufacturer.

B. Maintain these conditions 24 hours before, during, and after installation of adhesive and wall covering.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Manufacturers:
   1. Acoufelt: www.acoufelt.com.
   2. Forbo Flooring Systems: www.forbo.com
   3. Koroseal/RJF International: www.koroseal.com.
   4. MDC Wallcoverings: www.mdcwall.com.
   5. Tri-Kes/Source One: www.tri-kes.com.
   6. Substitutions: See Section 01 6000 - Product Requirements.

2.02 WALL COVERINGS

A. General Requirements:
   1. Surface Burning Characteristics: Flame spread/Smoke developed index of 15/200, maximum, when tested in accordance with ASTM E84.
   2. Chemical and Stain Resistance: No visible staining or discoloration and no damage to surface texture when tested in accordance with ASTM D1308.

B. Acoustical Wall Covering:
   1. Material: FilaSorb polyester felt.
   2. Weight" 14mm, 0.49 lb./ft2 (±10%).
   3. Size: See drawings for size and configuration.
   4. NRC Rating:
      a. 0.55, no air gap
      b. 0.70, 20mm air gap
      c. 0.75, 50mm air gap
   5. See schedule of Materials on the drawings for additional information.

C. Cork Wall Covering:
   1. Uni-color resilient homogeneous tackable linoleum surface consisting of linseed oil, granulated cork, rosin binders, and dry pigments calendered onto natural burlap backing.
   2. Color shall extend through thickness of material.
   3. Width: 48 inch
   4. Gauge: 1/4 inch
   5. Flexible enough to bend around a 2-3/4 inch radius
   6. Product and Color: See Schedule of Materials and Colors.

D. Adhesive: Mold and mildew resistant. Type recommended by wall covering manufacturer to suit application to substrate.

E. Substrate Filler: As recommended by adhesive and wall covering manufacturers; compatible with substrate.

F. Substrate Primer and Sealer: Alkyd enamel type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work, and conform to requirements of the wall covering manufacturer.

B. Measure moisture content of surfaces using an electronic moisture meter. Do not apply wall coverings if moisture content of substrate exceeds level recommended by wall covering manufacturer.

C. Verify flatness tolerance of surfaces does not vary more than 1/8 inch in 10 feet nor vary at a rate greater than 1/16 inch/ft.

3.02 PREPARATION

A. Wash impervious surfaces with tetra-sodium phosphate, rinse and neutralize; wipe dry.

B. Surface Appurtenances: Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.

C. Surfaces: Correct defects and clean surfaces that affect work of this section. Remove existing coatings that exhibit loose surface defects.

D. Marks: Seal with shellac those that may bleed through surface finishes.

3.03 INSTALLATION

A. Apply adhesive and wall covering in accordance with manufacturer's instructions.

B. Apply adhesive to wall surface immediately prior to application of wall covering.

C. Use wall covering in roll number sequence.

D. Razor trim edges on flat work table. Do not razor cut on gypsum board surfaces.

E. Apply wall covering smooth, without wrinkles, gaps or overlaps. Eliminate air pockets and ensure full bond to substrate surface.

F. Horizontal seams are not acceptable.

G. Do not seam within 2 inches of internal corners or within 6 inches of external corners.

H. Install wall covering before installation of bases and items attached to or spaced slightly from wall surface.

I. Do not install wall covering more than 1/4 inch below top of resilient base.

J. Cover spaces above and below windows, above doors, in pattern sequence from roll.

K. Apply wall covering to electrical wall plates prior to replacing.

L. Wall covering is required behind fin tube cabinets.

M. Where wall covering tucks into reveals, or metal wallboard or plaster stops, apply with contact adhesive within 6 inches of wall covering termination. Ensure full contact bond.

N. Remove excess adhesive while wet from seam before proceeding to next wall covering sheet. Wipe clean with dry cloth.

3.04 CLEANING

A. Clean wall coverings of excess adhesive, dust, dirt, and other contaminants.

B. Reinstall wall plates and accessories removed prior to work of this section.

3.05 PROTECTION

A. Do not permit construction activities at or near finished wall covering areas.

END OF SECTION

SECTION 09 7223
CUSTOM DIGITAL WALL COVERING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Custom Digital Wall Covering.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry

B. Section 09 2116 - Gypsum Board Assemblies

1.03 REFERENCE STANDARDS

A. ASTM D1308 - Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Coating Systems; 2020.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023.

C. ASTM F793/F793M - Standard Classification of Wall Coverings and Ceiling Coverings by Use Characteristics; 2025.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on wall covering and adhesive.

C. Shop Drawings: Indicate wall elevations with seaming layout.

D. Samples: Samples and strike-offs shall be sent to the Architect/Designer and Owner for final approval.

E. No product shall be fabricated or installed without signature and approval of the Owner.

F. Test Reports: Indicate verification of flame and smoke ratings, when tested by UL.

G. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention. All special instructions shall be provided by the Manufacturer to the Contractor.

H. Maintenance Data: Submit data on cleaning, touch-up, and repair of covered surfaces.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Provide final digital print files, shop drawings and product data for Owner's use.

1.05 ENVIRONMENTAL CONDITIONS

A. Maintain room and substrate temperature and humidity within the ranges recommended by the graphic film manufacturer at least 24 hours prior to, during, and after installation, until Substantial Completion.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum three years of experience.

B. Installer Qualifications: Company specializing in performing the type of work specified in this section with minimum three years of experience.

C. Applicator Qualifications: Work of this section shall be performed by a firm regularly engaged in the installation of environmental graphics of the types and qualities specified, coordinated by Manufacturer/Contractor, and acceptable to the Architect/Designer.

D. Field verifications/dimensions shall be sent to the General Contractor and coordinated with the Installer and Manufacturer before any artwork is to be printed or executed. Graphics company shall coordinate a trip with the contractor to the site to pre-measure walls prior to the release of any material.

E. Color match on graphic prints may have some slight variability due to printer and monitor calibration.

1.07 MOCK-UP

A. Locate where directed.

B. Mock-up may remain as part of the Work.

C. Architect/Designer may provide additional drawings to clarify design intent if required.

D. Photo Murals: Install sample panel mock-up in area at designated viewing distance for Owner review and approval.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle and store products as recommended by the manufacturer(s), in graphics provider's labeled protective packaging. Protect from damage and deterioration.

B. Inspect roll materials at arrival on site, to verify acceptability.

C. Protect packaged adhesive from temperature cycling and cold temperatures.

D. Do not store roll goods on end.

1.09 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the adhesive or wall covering product manufacturer.

B. Maintain these conditions 24 hours before, during, and after installation of adhesive and wall covering.

1.10 WARRANTY

A. Graphics provider shall provide a 5-year material and labor warranty against fading, edge lifting, peeling, discoloration, delamination of the overlaminate from the vinyl graphics film, and delamination of the vinyl film from the painted Level 5 skim-coated smooth-painted gypsum board substrate.

PART 2 PRODUCTS

2.01 ACCEPTABLE PRODUCTS, MANUFACTURERS AND GRAPHICS PROVIDERS

A. Specifications are based on products, manufacturers and graphics providers named herein or listed as the Basis of Design. Products of manufacturers listed which meet or exceed specifications are approved for use on the Project. Other manufacturers and graphics providers must have a minimum of five (5) years experience supplying (and for graphics providers, installing) products meeting or exceeding the specifications, and comply with requirements of 01 3000-Administrative Requirements, for submittal procedures to be considered.

2.02 GRAPHICS PROVIDER

A. Basis of Design: Riot Creative Imaging division of ARC, 3700 Westchase Dr, Houston, TX 77042; www.riotcolor.com - Contact – Bruce Newton – Senior Graphic Solutions Consultant – bnewton@riotcolor.com - Cell: 832-875-0425.

B. Single-source Responsibility: Graphics Provider shall be solely responsible for processing, production and installation, whether installation is performed by its own personnel or by its approved installation contractor.

C. Photo Murals: Large scale wall graphics digitally printed on self-adhesive vinyl graphics film.

1. File Type: Owner to provide largest photography file format of original. Owner will provide PDF, EPS, TIFF, JPG, or PSD file.
2. File Preparation: Embed or convert font into outlines. If not providing a PDF, package a ZIP file with original file, fonts, and linked images.
3. Resolution:
   a. Minimum dpi is determined by full-scale, final size of image and the viewing distance of the mural.
4. Install sample panel mock-up in final installation area indicated on Drawings for Owner review and approval.

D. Alternative vendors to be submitted by substitution request by 01 3000 “Administrative”.

2.03 EQUIPMENT

A. Basis of Design Printer: EFI Grand Format Printer using Ricoh Gen5 PiezoElectric Printheads; 54 inch wide media capacity; 600 dpi minimum resolution, or equivalent equipment acceptable to the Architect and compatible with the specified (or approved substitution) inks and media.

B. Laminator: Compatible with the specified (or approved substitution) vinyl film media, inks and overlaminate.

2.04 MATERIALS

A. Basis of Design for VWC-Drywall Application:
   1. Inks: EFI Superflex Inks, UV-resistant, odorless pigmented inks.
      a. Curing: UV Cured
      b. VOCs: Less than 294 g/L
      c. Hazardous Air Pollutants (HAPs): None.
      d. Hazard Warning Labels: None (cautionary only; no "R" phrases).
      e. Flammability/ combustibility: Nonflammable; noncombustible; FP > 93.3C
   2. Vinyl Wall Covering: Dreamscape Mystical.
      a. Description: Commercial grade vinyl printable vinyl wallcovering media for modern wide format inkjet printers.
      b. Construction: Embossed vinyl face with laminated fabric backing.
      c. Backing: Poly-cotton woven or polyester/pulp non-woven.
      d. Type Properties: Passes all criterion for WA 101, Type II.
      e. Thickness: 0.017 in.
   3. Accessory products, tools, and equipment: Recommended by, or acceptable to, the manufacturers of the materials with which they are used.

B. Basis of Design for CMU Application:
   1. Vinyl Graphics Film: 3M™ "Envision 480MC™ Graphic Film" cast vinyl film suitable for inkjet printing. Calendared films are not acceptable.
      a. Film Thickness: 0.05 mm (2 mil, 0.002 inch)
      b. Surface: Smooth, white, opaque and glossy.
      c. Applied shrinkage: < 0.1 mm per FTM 14.
      d. Adhesive: Factory-applied 3M "Comply™ v3" solvent acrylic pressure-sensitive repositionable adhesive with air release channels, protected by double-sided polyethylene coated paper, for dry application only, for permanent, non-removable installation.
         1) Adhesion: Approximately 18 N/25 mm per FTM 1 (180 degree peel, glass, 24h, 23 degrees C, 50 percent RH)
      e. Inks: EFI Superflex Inks, UV-resistant, odorless pigmented inks
      f. Curing: UV Cured
      g. VOCs: Less than 294 g/L
      h. Hazardous Air Pollutants (HAPs): None.
      i. Hazard Warning Labels: None (cautionary only; no "R" phrases).

j. Flammability/ combustibility: Nonflammable; noncombustible; FP > 93.3C

2. Protective Laminating Film: 3M™ 8520 Matte Laminate cast film. Calendared films are not acceptable.
   a. Matte Finish
   b. Exceptional conformability and lifting resistance
   c. Less prone to scratching
   d. Superior UV and acid dew protection
   e. Longer term vertical durability
   f. Horizontal warranty
3. Cast Adhesive backed film 3M™ Print Wrap Film IJ180mC for Solvent, UV and Latex Inkjet Printing. This film utilizes 3M™ Controltac™ and 3Mtm Comply™ technology
   a. Thickness w/ adhesive 0.08 – 0.10mm
   b. Acrylic pressure-sensitive, repositionable
   c. Opaque films: grey, transparent films: clear
   d. Adhesion: ABS 20 +/- 2 N/24mm
      1) Indicative values: Aluminum etched 24.5 +/- N/25mm
      2) Paint: 17.5 +/- 4 N/25mm
   e. Application method: Dry only
   f. 3M basic product warranty
   g. Expected Performance Life
      1) White: 10 years
      2) Transparent: 8 years
      3) Metallic: 6 years

2.05 PROCESSING AND PRODUCTION

A. Lay out each mural image in full-height vertical panels without horizontal seams. Allow overlap at vertical seams for accurate alignment and trimming. Unless otherwise specifically authorized by the Architect, lay out so panels are equal in width and arranged symmetrically. In no case shall a panel be less than one-half the vinyl media width.

B. For uniform appearance, produce all panels using vinyl film media, inks, and laminating film that are each sourced from a single manufacturing lot or production run.

C. Each panel shall be free from skipped print head scan lines, ink deposition irregularities, physical defects and other noticeable flaws. If flaws are found, reprint as many panels as necessary for flawless appearance and consistent color match between all panels.
   1. All vinyl wall coverings located on exterior walls shall be micro-perforated for permeability.

D. Color Mode and Image Resolution: All images and files shall be submitted and printed in CMYK color mode. Image resolution for offset and digital print shall be 300 DPI at final size. Image resolution for wide format print shall be minimum 125 DPI at final size.

E. All vinyl wall coverings located on exterior walls shall be micro-perforated for permeability.

F. Accessories:
   1. Adhesive: Type recommended by wall covering manufacturer to suit application to substrate.
   2. Termination Trim: Extruded plastic, color as selected.
   3. Substrate Filler: As recommended by adhesive and wall covering manufacturers; compatible with substrate.
   4. Substrate Primer and Sealer: Alkyd enamel type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work, and conform to requirements of the graphics manufacturer.

B. Measure moisture content of surfaces using an electronic moisture meter. Do not apply wall coverings if moisture content of substrate exceeds level recommended by wall covering manufacturer.

C. Verify flatness tolerance of surfaces does not vary more than 1/8 inch in 10 feet nor vary at a rate greater than 1/16 inch/ft.

D. Upon discovery of unacceptable conditions, including but not limited to, finish level, light swithces, outlet covers, supply/return grills and any other obstructions within the graphic area, the installer will notify the client and Architect/Designer and not proceed until the conditions are acceptable. Starting installation constitutes acceptance of surface conditions.

3.02 PREPARATION

A. Acclimatize printed vinyl film and other materials to the environment where they will be installed for at least 24 hours prior to commencement of installation, or for a longer period if recommended by the manufacturer.

B. Prior to installation, re-inspect mural panels closely for skipped print head scan lines, ink deposition irregularities, physical defects and other noticeable flaws. If flaws are found, reprint and replace as many panels as necessary for flawless appearance and consistent color match between all panels.

C. Fill cracks in substrate and smooth irregularities with filler; sand smooth.

D. Wash impervious surfaces with tetra-sodium phosphate, rinse and neutralize; wipe dry.

E. Surface Appurtenances: Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.

F. Surfaces: Correct defects and clean surfaces that affect work of this section. Remove existing coatings that exhibit loose surface defects.

G. Marks: Seal with shellac those that may bleed through surface finishes.

H. Apply one coat of primer sealer to substrate surfaces. Allow to dry. Lightly sand smooth.

I. Vacuum clean surfaces free of loose particles.

3.03 INSTALLATION

A. Digitally-Printed Vinyl Murals:
   1. Installation shall be performed only by trained, experienced personnel approved by the graphics provider.
      a. Install in accordance with manufacturer’s instructions and reviewed submittals.
      b. Install in location(s) shown on drawings
      c. Seams: Hairline, with overlapped, razor-cut butt joints. Visually align adjacent panels for accurate registration with no visible gaps, offsets or misalignments.
      d. Install without bubbles, wrinkles, gaps, fish mouths and other surface and seam irregularities for a smooth, uniform appearance.

B. Apply adhesive and wall covering in accordance with manufacturer's instructions.

C. Apply adhesive to wall surface immediately prior to application of wall covering. Let contact adhesive set tack free.

D. Use wall covering in roll number sequence.

E. Razor trim edges on flat work table. Do not razor cut on gypsum board surfaces.

F. Apply wall covering smooth, without wrinkles, gaps or overlaps. Eliminate air pockets and ensure full bond to substrate surface. Butt edges tightly.

G. Horizontal seams are not acceptable.

H. Do not seam within 2 inches of internal corners or within 6 inches of external corners.

I. Install wall covering before installation of bases and items attached to or spaced slightly from wall surface.

J. Do not install wall covering more than 1/4 inch below top of resilient base.

K. Cover spaces above and below windows, above doors, in pattern sequence from roll.

L. Before cutting, field install to layout environmental design elements in accordance with submittal drawings and any additional design intent drawings provided by Architect/Designer for installation reference. Examine each element for color consistency, accuracy, and proper design dimension.

M. Request inspection by the Architect/Designer if there are variations in color, pattern, or design that are considered to be excessive.

N. Where wall covering tucks into reveals, or metal wallboard or plaster stops, apply with contact adhesive within 6 inches of wall covering termination. Ensure full contact bond.

O. Install termination trim.

P. Remove excess adhesive while wet from seam before proceeding to next wall covering sheet. Wipe clean with dry cloth.

3.04 CLEANING

A. Clean wall coverings of excess adhesive, dust, dirt, and other contaminants.

B. Reinstall wall plates and accessories removed prior to work of this section.

3.05 PROTECTION

A. Do not permit construction activities at or near finished graphics areas.

END OF SECTION

SECTION 09 8400
ACOUSTICAL PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabric-covered fiberglass core panels and mounting accessories.

B. Damage resistant fabric-covered fiberglass core panels and mounting accessories.

C. Formed fire resistant plastic panels

D. Acoustical Ceiling Baffles

E. Acoustical Wall Baffles

1.02 RELATED REQUIREMENTS

A. Section 09 5100 - Acoustical Ceilings

1.03 REFERENCE STANDARDS

A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2017.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023.

C. ASTM E795 - Standard Practices for Mounting Test Specimens During Sound Absorption Tests; 2016.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed data sheets for products specified.

C. Shop Drawings: Fabrication and installation details, panel layout, and fabric orientation.

D. Selection Samples: Manufacturer's color charts for fabric covering, indicating full range of fabrics, colors, and patterns available .

E. Verification Samples: Fabricated samples of each type of panel specified; 12 by 12 inch, showing construction, edge details, and fabric covering.

F. Test Reports: Certified test data from an independent test agency verifying that panels meet specified requirements for acoustical and fire performance.

G. Closeout Submittals
   1. Submit under provisions of Section 01 7800 - Closeout Submittals.
   2. Submit Material Safety Data Sheets under provisions of Section 01 7800 - Closeout Submittals for the following items:
      a. All mastics, glues, and adhesives
      b. Thermal insulation (excluding fiberglass, foam, rubber)

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company with not less than five years of experience in manufacturing acoustical products similar to those specified.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect acoustical panels from moisture during shipment, storage, and handling. Deliver in factory-wrapped bundles; do not open bundles until panels are needed for installation.

B. Store panels flat, in dry, well-ventilated space; do not stand panels on end.

C. Protect panel edges from damage.

1.07 WARRANTY

A. Comply with requirements of Section 01 7800 - Closeout Submittals.

B. Submit a written warranty, executed by the Contractor, agreeing to repair or replace panels that fail in materials or workmanship within the specified warranty period.
   1. Warranty Period: Two (2) years after date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fabric-Covered Acoustical Panels:
   1. Acoustical Products and Systems: www.acousticalproducts.com.
   2. Armstrong World Industries, Inc: www.armstrong.com.
   3. AVL Systems, Inc.: www.AVLonline.com
   4. CertainTeed Corporation: www.certainteed.com.
   5. Conwed Designscape | Wall Technology: www.conweddesignscape.com.
   6. Essi Acoustical Products Company: www.essiacoustical.com.
   7. Quiet Technology Systems: www.qtechsys.com
   8. USG: www.usg.com.
   9. Substitutions: See Section 01 6000 - Product Requirements.

B. Acoustical Ceiling Baffles
   1. Frasch: www.frasch.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

C. Acoustical Wall Baffles
   1. Turf Design, Inc.: www.turf.design.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FABRIC-COVERED ACOUSTICAL PANELS

A. Panels: Prefinished, factory assembled fabric-covered panels.
   1. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.

B. Fiberglass Core Panels: Typical, Unless Noted Otherwise
   1. Density: 6 to 7 lb/cu ft.
   2. Noise Reduction Coefficient (NRC): 0.80 to 0.90 when tested in accordance with ASTM C423for Type A mounting, per ASTM E795.
   3. Panel Width: As detailed.
   4. Panel Height: As detailed.
   5. Panel Thickness: 2 inch.
   6. Edges: Perimeter edges reinforced by a formulated resin hardener.
   7. Edge Profile: Beveled
   8. Corners: Square.
   9. Mounting: Mounting shall be continuous Z-bars per architectural drawings. All mountings are supplied by the manufacturer unless noted otherwise.

C. Fiberglass Core Panels: Gymnasiums or Activity Rooms
   1. Density: 6 to 7 lb/cu ft.
   2. 2 inch cores laminated with a 1/16" thick perforated resilient damage resistant face sheet
   3. Noise Reduction Coefficient (NRC): 1.00 minimum when tested in accordance with ASTM C423for Type A mounting, per ASTM E795.
   4. Panel Width: As detailed.
   5. Panel Height: As detailed.
   6. Panel Thickness: 2-1/16 inch.
   7. Edges: Perimeter edges reinforced by a formulated resin hardener.

8. Edge Profile: Square
9. Corners: Square.
10. Mounting: Mounting shall be continuous Z-bars per architectural drawings. All mountings are supplied by the manufacturer unless noted otherwise.

D. Fiberglass Core and Formed Fire Resistant Plastic Panels: Band and Choir Rooms
1. Absorber Panels:
   a. Fiberglass Core Density: 6 to 7 lb/cu ft.
   b. Edges: Perimeter edges reinforced by a formulated resin hardener.
   c. Panel Thickness: 2 inch at Music, Choir and 4 inch at Band Halls.
   d. Edge Profile: Square
   e. Corners: Square.
2. Diffuser Panels:
   a. Diffuser Construction: 0.125 inch Thermo-formed fire resistant plastic molded to a one-piece Barrel or a special offset Pyramidal shape.
   b. All diffuser panels constructed of Class A materials (NFPA 101 Life Safety Code Requirements for Class A Interior Finishes are: Flame Spread 0-25, Smoke Developed 0-450).
   c. Edge Profile: No flange for walls and hardware ceiling mount.
   d. Corners: Radiused.
3. Acoustical Performance Requirements
   a. Sound absorption coefficients, measured with a Type A and Type E-400 mounting, according to ASTM E795 (if applicable) or according to application mounting method, determined by ASTM C423.
   b. Sound Transmission Class (STC), determined according to ASTM E90 and ASTM E413: Type I convex ceiling diffuser panel, 4' x 4'; STC 23; Type I pyramidal ceiling diffuser panel, 4' x 4'; STC 22.
4. Finishes
   a. Ceiling/Wall-mounted absorber panels: Fabric wrap entire core and glued to back of panel.
   b. Ceiling/Wall-mounted diffuser panels: Manufacturer's standard white, "orange peel" texture.
5. Mounting Hardware
   a. Wall mounting (absorbers and diffusers): Continuous wall and panel Z-bars per architectural drawings. Provide 2" minimum clearance above top of panel for placement and removal of panel.
   b. Ceiling mounting (absorbers and diffusers): Four corner hook suspended by wire to ceiling; lay-in hardware for ceiling grid; (minimum frame width 15/16"); direct ceiling mounting hardware.
6. Panel Width: As detailed.
7. Panel Height: As detailed.

E. Fabric Covering: Seamless fabric facing material, for bonded covering of core material.
1. Fabric shall be applied directly to the face and edges of the panel and return to the back of the panel to provide a full finished edge. All corners are fully tailored.
2. Fabric: See Section 01 6210 - Schedule of Materials and Colors for fabric selection.
3. Patterns: Where fabric with directional or repeating patterns or fabric with directional weave is used, mark for installation in same direction.

2.03 ACOUSTICAL CEILING BAFFLES

A. General:
1. Prefinished, factory-assembled fabric-covered panels and baffles with 100 percent polyethylene terephthalate (PET), 55 percent recycled content, minimum.

2. Surface Burning Characteristics: Fire rating Class A, when tested in accordance with ASTM E84.

B. Ceiling Baffles:
1. Baffle Core: Manufacturer's standard rigid or semi-rigid fiberglass core.
2. Sound Absorption: Noise reduction coefficient (NRC) of 1.1 when tested in accordance with ASTM C423.
3. Baffle Size: Custom shapes. See drawings for configurations.
4. PET Thickness: 0.47 inch.
5. Color: As indicated on drawings.
6. Mounting: Vertically suspended from ceiling or structure by one edge of panel.

2.04 ACOUSTICAL WALL BAFFLES

A. General:
1. Prefinished, factory-assembled fabric-covered panels and baffles with 100 percent polyethylene terephthalate (PET), 55 percent recycled content, minimum.
2. Surface Burning Characteristics: Fire rating Class A, when tested in accordance with ASTM E84.

B. Grille Wall Panels
1. Acoustic Rating: NRC 0.75, minimum.
2. PET Thickness: 9mm.
3. Mounting: Mounting shall be continuous Z-bars per architectural drawings. All mountings are supplied by the manufacturer unless noted otherwise.
4. Color: As indicated on drawings.
5. Size: See drawings for configurations.

2.05 FABRICATION

A. Fabric Wrapped, General: Fabricate panels to sizes and configurations indicated, with fabric facing installed without sagging, wrinkles, blisters, or visible seams.
1. Where radiused or mitered corners are indicated, install fabric to avoid seams or gathering of material.

B. Tolerances: Fabricate to finished tolerance of plus or minus 1/16 inch for thickness, overall length and width, and squareness from corner to corner.

2.06 ACCESSORIES

A. Back-Mounting Accessories: Manufacturer's standard accessories for concealed support, designed to allow panel removal, and as follows:
1. Mounting shall be continuous Z-bars per architectural drawings. All mountings are supplied by the manufacturer unless noted otherwise

B. Ceiling-Suspended Accessories: Manufacturer's standard systems on each baffel, sized appropriately for weight.
1. Provide galvanized wire for suspension from ceiling at heights indicated.

C. Trim Moldings: Manufacturer's standard wood or vinyl trim moldings for concealing panel joints; color as selected from manufacturer's standards.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates for conditions detrimental to installation of acoustical panels. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install acoustical panels in locations indicated, following installation recommendations of panel manufacturer. Align panels accurately, with edges plumb and top edges level. Scribe to fit accurately at adjoining work and penetrations.

B. Install panels to construction tolerances of plus or minus 1/16 inch for the following:
   1. Plumb and level.
   2. Flatness.
   3. Width of joints.

3.03 CLEANING

A. Clean fabric facing upon completion of installation from dust and other foreign materials, following manufacturer's instructions.

B. Remove surplus materials, trimmed portions of panels, and debris resulting from installation.

3.04 PROTECTION

A. Provide protection of installed acoustical panels until completion of the work.

B. Replace panels that cannot be cleaned and repaired to satisfaction of the Architect.

END OF SECTION

SECTION 09 9000
PAINTING AND COATING

PART 1 - GENERAL

1.01 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, but is not limited to:
   1. Exterior paints and coatings systems including; paints, stains, transparent coatings, and opaque finishes.
   2. Interior paint and coatings systems including; paint, stains, transparent coatings, and opaque finishes.
   3. Specific products and painting scheduled in this Section are based, in general, on products of Benjamin Moore & Co. Products of other manufacturers listed in paragraph 2.01 may be substituted with approved color matches.

1.02 RELATED SECTIONS

A. Section 05 2100 - Steel Joist Framing: Shop priming

B. Section 05 5000 - Metal Fabrications: Shop priming

C. Section 06 2000 - Finish Carpentry: Back priming of trim and paneling

D. Section 07 8123 - Intumescent Fire Protection: Field-applied paints coordination with intumescent fireproofing substrate.

E. Division 23 - Mechanical Identification: Markers and color-coding

F. Division 26 - Electrical Identification: Markers and color-coding

1.03 REFERENCES

A. Industry Association Standards
   1. SSPC-SP 1 - Solvent Cleaning.
   2. SSPC-SP 2 - Hand Tool Cleaning.
   3. SSPC-SP 3 - Power Tool Cleaning.
   4. SSPC-SP 13 / NACE No. 6 Surface Preparation for Concrete.

1.04 DEFINITIONS

A. Paint
   1. Means coating systems materials including primers, emulsions, epoxy, enamels, sealers, fillers, and other applied materials whether used as prime, intermediate, or finish coats.

1.05 SUBMITTALS

A. Shop drawings, product data, and samples under provisions of Section 01 3000 - Administrative Requirements.

B. Product Data: Manufacturer's data sheets on each paint and coating product should include:
   1. Product characteristics
   2. Surface preparation instructions and recommendations
   3. Primer requirements and finish specification
   4. Storage and handling requirements and recommendations
   5. Application methods
   6. Cautions

C. Selection Samples: Submit a complete set of color chips that represent the full range of manufacturer's color samples available.

D. Verification Samples: For each finish product specified, submit 8”x10” samples that represent actual product, color, and sheen.

E. Closeout Submittals
   1. Submit under provisions of Section 01 7800 - Closeout Submittals.
   2. Upon conclusion of the project, the Contractor or paint manufacture/supplier shall furnish a coating maintenance manual. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product data pages, Material Safety Data Sheets, care and cleaning instructions, touchup procedures, and color samples of each color and finish used.

1.06 QUALITY ASSURANCE

A. Qualifications
   1. Single Source Responsibility:
      a. Obtain each type of material required from single source.

B. Pre-installation Meetings
   1. Comply with provisions of Section 01 3000 - Administrative Requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Section 01 6000 - Product Requirements.

B. Delivery: Deliver manufacturer's unopened containers to the work site. Packaging shall bear the manufacturer's name, label, and the following list of information:
   1. Product name, type (description)
   2. Application and use instructions
   3. Surface preparation
   4. VOC content
   5. Environmental issues
   6. Batch date
   7. Color number

C. Storage: Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

D. Store materials in an area that is within the acceptable temperature range, per manufacturers instructions. Protect from freezing.

E. Handling: Maintain a clean, dry storage area, to prevent contamination or damage to the coatings.

1.08 PROJECT CONDITIONS

A. Project Environmental Requirements
   1. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not apply coatings under environmental conditions outside manufacturer's absolute limits.

1.09 MAINTENANCE

A. Extra Materials
   1. At completion of project, deliver to Owner extra stock of materials used on project as follows:
      a. Five (5) gallons for each field color/type, two (2) gallons for trim and accent of each color/type.
   2. Store in location as directed by Owner.
   3. Ensure containers are sealed and identified by manufacturer, type, and color.
   4. Submit maintenance data under provisions of Section 01 7800 - Closeout Submittals.
   5. Include cleaning methods, and recommended cleaning solutions.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements indicated herein, provide products of one of the listed manufacturers.

B. Benjamin Moore & Co.: www.benjaminmoore.com.

C. Sherwin-Williams Co.: www.sherwin-williams.com.

D. Substitutions: Under provisions of Section 01 6000 - Product Requirements.

2.02 MATERIALS - GENERAL

A. Paints and Coatings - General:
   1. Unless otherwise indicated, provide factory-mixed coatings. When required, mix coatings to correct consistency in accordance with manufacturer's instructions before application. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.
   2. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.

B. Primers:
   1. Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

C. Compatibility with other materials:
   1. Topcoats: Suitable for application over applied intumescent coatings; of type recommended in writing by intumescent coatings manufacturer for each fire resistance design. Topcoat to have been tested by manufacturer for compatibility in fire conditions with documentation of such tests to be provided upon request. Color of topcoat shall be as selected by the architect. Colors shall not be limited to manufacturer's standard colors.
   2. See Section 07 8123 - Intumescent Fire Protection for additional information.

2.03 COLOR SCHEDULES

A. See color schedule on the drawings and Section 01 6210 - Schedule of Materials and Colors.

B. The Architect may select, allocate, and vary colors on different surfaces throughout the Work, subject to the following.
   1. Exterior work: A maximum of three (3) different colors will be used, with variations for trim, doors, miscellaneous work, and metal work.
   2. Interior work: A maximum of ten (10) different pigmented colors will be used, with variations for trim and wall surfaces and wainscots.
   3. Dark tones: A maximum of five (5) dark tones will be used as accent colors for interior.

C. All painted graphics shown on the drawings shall be included in the base proposal and shall be included in this section. Contractor shall note that school colors and mascot may be released after initial color selection. Contractor shall make all necessary adjustments.

2.04 MISCELLANEOUS MATERIALS

A. Coating Application Accessories
   1. Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required per manufacturer's specifications.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Do not begin application of coatings until substrates have been properly prepared. Notify Architect of unsatisfactory conditions before proceeding

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Proceed with work only after conditions have been corrected, and approved by all parties, otherwise application of coatings will be considered as an acceptance of surface conditions.

3.02 PREPARATION

A. Comply with provisions of Section 01 7000 - Execution and Closeout Requirements.

B. The surface must be dry and in sound condition. Remove oil, dust, dirt, loose rust, peeling paint or other contamination to ensure good adhesion.

C. Remove mildew before painting by washing with a solution of 1 part liquid household bleach and 3 parts of warm water. Apply the solution and scrub the mildewed area. Allow the solution to remain on the surface for 10 minutes. Rinse thoroughly with clean water and allow the surface to dry 48 hours before painting. Wear protective glasses or goggles, waterproof gloves, and protective clothing. Quickly wash off any of the mixture that comes in contact with your skin. Do not add detergents or ammonia to the bleach/water solution.

D. No exterior painting should be done immediately after a rain, during foggy weather, when rain is predicted, or when the temperature is below 50°F, unless products are designed specifically for these conditions.

E. Methods:
   1. Concrete Masonry Units
      a. Remove all loose mortar and foreign material. Surface must be free of laitance, concrete dust, dirt, form release agents, moisture curing membranes, loose cement, and hardeners. Concrete and mortar must be cured at least 30 days at 75°F. The pH of the surface should be between 6 and 9, unless the products to be used are designed to be used in high pH environments. On tilt-up and poured-in-place concrete, commercial detergents and abrasive blasting may be necessary to prepare the surface. Fill bug holes, air pockets, and other voids with a cement patching compound.
   2. Concrete, SSPC-SP13 or NACE 6
      a. This standard gives requirements for surface preparation of concrete by mechanical, chemical, or thermal methods prior to the application of bonded protective coating or lining systems. The requirements of this standard are applicable to all types of cementitious surfaces including cast-in-place concrete floors and walls, precast slabs, masonry walls, and shotcrete surfaces. An acceptable prepared concrete surface should be free of contaminants, laitance, loosely adhering concrete, and dust, and should provide a sound, uniform substrate suitable for the application of protective coating or lining systems.
   3. Drywall-Interior
      a. Must be clean and dry. All nail heads must be set and spackled. Joints must be taped and covered with a joint compound. Spackled nail heads and tape joints must be sanded smooth and all dust removed prior to painting.
   4. Galvanized Metal
      a. Clean per SSPC-SP1 using detergent and water or a degreasing cleaner to remove greases and oils. Apply a test area, priming as required. Allow the coating to dry at least one week before testing. If adhesion is poor, Brush Blast per SSPC-SP7 is necessary to remove these treatments.
   5. Steel: Structural, Plate, Doors and Frames, etc.
      a. Should be cleaned by one or more of the surface preparations described below. All metal shall be thoroughly prepared to ensure adhesion of new paint to the prepared surface. All prepared surfaces shall be observed and approved by the Owner or Owners Representative before new paint is applied.
      b. Solvent Cleaning, SSPC-SP1

1) Solvent cleaning is a method for removing all visible oil, grease, soil, drawing and cutting compounds, and other soluble contaminants. Solvent cleaning does not remove rust or mill scale. Change rags and cleaning solution frequently so that deposits of oil and grease are not spread over additional areas in the cleaning process. Be sure to allow adequate ventilation.

c. Hand Tool Cleaning, SSPC-SP2
   1) Hand Tool Cleaning removes all loose mill scale, loose rust and other detrimental foreign matter. It is not intended that adherent mill scale, rust, and paint be removed by this process. Before hand tool cleaning, remove visible oil, grease, soluble welding residues, and salts by the methods outlined in SSPC-SP1.

d. Power Tool Cleaning, SSPC-SP3
   1) Power Tool Cleaning removes all loose mill scale, loose rust, and other detrimental foreign matter. It is not intended that adherent mill scale, rust, and paint be removed by this process. Before power tool cleaning, remove visible oil, grease, soluble welding residues, and salts by the methods outlined in SSPC-SP1.

6. Stucco
   a. Must be clean and free of any loose stucco. If recommended procedures for applying stucco are followed, and normal drying conditions prevail, the surface may be painted in 30 days. The pH of the surface should be between 6 and 9, unless the products to be used are designed to be used in high pH environments such as Loxon.
7. Wood-Exterior
   a. Must be clean and dry. Prime and paint as soon as possible. Knots and pitch streaks must be scraped, sanded, and spot primed before a full priming coat is applied. Patch all nail holes and imperfections with a wood filler or putty and sand smooth.
8. Wood-Interior
   a. All finishing lumber and flooring must be stored in dry, warm rooms to prevent absorption of moisture, shrinkage, and roughening of the wood. All surfaces must be sanded smooth, with the grain, never across it. Surface blemishes must be corrected and the area cleaned of dust before coating.

3.03 APPLICATION

A. Comply with provisions of Section 01 7000 - Execution and Closeout Requirements.

B. Testing: Due to the wide variety of substrates, preparation methods, application methods and environments, one should test the product in an inconspicuous spot for adhesion and compatibility prior to full-scale application.

C. Apply all coatings and materials with manufacture specifications in mind. Mix and thin coatings according to manufacture recommendation.

D. Do not apply to wet or damp surfaces.
   1. Wait at least 30 days before applying to new concrete or masonry. Or follow manufactures procedures to apply appropriate coatings prior to 30 days.
   2. Test new concrete for moisture content.
   3. Wait until wood is fully dry after rain or morning fog or dew.

E. Apply coatings using methods recommended by manufacturer.

F. Uniformly apply coatings without runs, drips, or sags, without brush marks, and with consistent sheen.

G. Apply coatings at spreading rate required to achieve the manufacturers recommended dry film thickness.

H. Regardless of number of coats specified, apply as many coats as necessary for complete hide.

I. All drywall installation areas shall be made ready for painting by first preparing the gypsum wallboard surfaces with texturing as specified. Apply in strict compliance with manufacturer's written directions. Omit texturing where wall carpet occurs, reference Finish Schedule on drawings.

J. At gymnasiums, contractor shall paint wood blocking for gym equipment supports to match adjacent color. Contractor shall coordinate the sequencing with all trades.

K. Exterior Woodwork: If final painting must be delayed more than 2 weeks after installation of woodwork, apply primer within 2 weeks and final coating within 2 weeks.

L. Miscellaneous surfaces and procedures
   1. Exposed mechanical items
      a. Finish electric panels, access doors, conduits, pipes, ducts, grilles, registers, vents, and items of similar nature to match the adjacent wall and ceiling surfaces, or as directed.
      b. Paint visible duct surfaces behind vents, registers, and grilles Flat Black.
      c. Wash metal with solvent, prime, and apply two coats of alkyd enamel.
   2. Exposed pipe and duct insulation
      a. Apply one coat of latex paint on insulation which has been primed under other Sections; apply two coats on such surfaces when unprepared.
      b. Match color of adjacent surfaces.
      c. Remove band before painting, and replace after painting.
   3. Hardware: Paint prime coated hardware to match adjacent surfaces.
   4. Wet areas
      a. In toilet rooms and contiguous areas, add an approved fungicide to paints.
   5. Exposed vents: Apply two coats of heat-resistant paint approved by the Architect.

M. Inspection: The coated surface must be inspected and approved by the architect just prior to each coat.

3.04 REPAIR/RESTORATION

A. For surfaces that are to receive new finish, prepare surface and apply materials as described below and per manufacture recommendation.

B. Preparation of Existing Surfaces That Have Been Previously Painted or Varnished:
   1. The workmanship shall be best quality, and the surface shall be prepared in a thorough manner in order that the new finish shall be as finished as if the surface had been new with all the usual preparation for new paint or varnish.
   2. All previously painted or varnished surfaces or surfaces that have been previously finished in any manner shall first be prepared to receive new finish or any sort, according to the following specifications:
      a. Existing painted sand finish plaster walls to be repainted
         1) Remove all scaled or loose paint.
         2) Fill all cracks in plaster as follows:
            (a) Large cracks - caulk with latex sealant.
            (b) Hairline cracks - Add 1 lb. of taping cement to 1 gallon of latex paint and brush across cracks until filled.
      b. Existing enamel or varnished surfaces on smooth plaster or any surface
         1) Add 4 tablespoons of Tri-Sodium Phosphate per quart of paint thinner and wash surfaces to be repainted not less than 4 hours nor more than 7 hours before painting first coat.
      c. Existing drywall partitions to receive new base.
         1) Upon removing existing rubber base, prepare wall surface to receive new base. Surface shall be leveled to meet adjacent surface. Texture wall as required to match existing.

C. Painting Existing Surfaces after Surfaces Have Been Prepared
   1. Sand Finish Plaster
      a. One coat primer-sealer colored to match finish coat. Primer-sealer will be a Zero VOC Interior Latex Primer.
      b. One coat of paint shown on schedule or two coats if required to fully cover for first quality finish.
   2. Concrete Masonry Units
      a. Same as sand finish plaster.
   3. Smooth Plaster Walls
      a. One coat Zero VOC Interior Latex Primer.
      b. Second coat will be as directed by the Architect.
   4. Varnished Surfaces to be Revarnished
      a. Repair scratches with Wiping Stain.
   5. Enameled Trim:
      a. Apply one coat Premium Wall & Wood Primer.
      b. Second coat will be as directed by the Architect.
   6. Hollow Metal Trim (Existing)
      a. Same as enamel trim.

3.05 PROTECTION

A. Protect finished coatings from damage until completion of project.

B. Touch-up damaged coatings after substantial completion, following manufacturer's recommendation for touch up or repair of damaged coatings. Repair any defects that will hinder the performance of the coatings.

PART 4 - SCHEDULES

4.01 GENERAL

A. Where painting occurs in addition or renovation projects provide low odor finishes shall be used.

B. The various surfaces and areas receiving finishes maybe indicated on the drawings or as noted below. The desired finishes are shown by code numbers. Not all codes listed below may be used. The required materials for each code number shown on the finish schedule are specified below under the corresponding code numbers.

4.02 PAINTING SCHEDULE

A. All products shall be Benjamin Moore or equivalent Sherwin-William products as follows:
   1. Painter’s Interior Caulk - Moorlastic Elastomeric Patching Compound No. 051.
   2. Type A Finished – Exterior Work: Provide 1 primer coat and 2 finish coats.
      a. PA – 1: Exterior Gloss Oil Base Enamel – all piping, metal and trim, including doors and frames – Impervo Alkyd High Gloss Metal and Wood Enamel No. C133.
      b. PA – 2: Traffic Marking Paint – Safety and Zone Marking Alkyd No. M56.
   3. Type B Finished – Interior Work: Provide 1 primer coat and 2 finish coats.
      a. PB – 1: Interior Latex Gloss Enamel – interior metal and wood trim – Impervex Latex High Gloss Metal and Wood Enamel No. 309. Provide manufactures rust inhibitive, corrosion resistant primer at AESS and other metal applications.
      b. PB – 2: Interior Alkyd Semi-Gloss Finish Enamel – on interior CMU walls and gypsum board ceilings – Moorcraft Super Spec® Alkyd Semi-Gloss Enamel No. C271.
      c. PB – 3: Interior Alkyd Eggshell finish – interior gypsum partitions – Moorcraft Super Craft® Latex Eggshell Enamel No. 251.

END OF SECTION

SECTION 10 1100
VISUAL DISPLAY UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Markerboards
B. Tackboards
C. Display Cases.

1.02 RELATED REQUIREMENTS

A. Section 05 4000 - Cold-Formed Metal Framing.
B. Section 06 1000 - Rough Carpentry: Blocking and supports.

1.03 REFERENCE STANDARDS

A. ANSI A135.4 - Basic Hardboard; 2012 (Reaffirmed 2020).
B. ASTM A424/A424M - Standard Specification for Steel, Sheet, for Porcelain Enameling; 2018.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide manufacturer's data on markerboard, tackboard, tackboard surface covering, trim, and accessories.
C. Shop Drawings: Indicate wall elevations, dimensions, joint locations , special anchor details.
D. Manufacturer's printed installation instructions.
E. Maintenance Data: Include data on regular cleaning, stain removal .

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
B. Provide 50 year warranty for markerboard to include warranty against discoloration due to cleaning, crazing or cracking, and staining.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. American Visual Display Products: www.americanvisualdisplay.com.
B. ASI Visual Display Products: www.asi-visualdisplayproducts.com.
C. Claridge Products and Equipment, Inc: www.claridgeproducts.com/#sle.
D. Ghent, a GMI Company: www.ghent.com/#sle.
E. MooreCo, Inc: www.moorecoinc.com/#sle.
F. Nelson Adams NACO: www.nelsonadamsnaco.com/#sle.
G. Substitutions: See Section 01 6000 - Product Requirements.

2.02 VISUAL DISPLAY UNITS

A. Markerboards: Porcelain enamel on steel, laminated to core.
   1. Basis of Design: Claridge LCS3 Series 1.
   2. Color: Low Gloss, White.
   3. Steel Face Sheet Thickness: 24 gage, 0.0239 inch .

4. Core: MDF, 7/16 inch thick, laminated to face sheet.
5. Backing: Steel back, laminated to core.
6. Size: As indicated on drawings.
7. Frame: Extruded aluminum , with concealed fasteners.
8. Frame Finish: Anodized, natural.
9. Markerboard Finish: Markerboard surface shall be consistent in appearance without fading or ghosting.
10. Accessories: Provide marker tray, map rail, flag holder, and metal display hooks at 2'-0" o.c. on map rail.
11. Omit marker tray in all "Activity Rooms", "Exterior Applications" and "Gymnasiums."

B. Tackboards: Fine-grained, homogeneous natural cork.
1. Acceptable Product: Claridge, Claridge Cork
2. Cork Thickness: 1/4 inch.
3. Color: As selected from manufacturer's full range.
4. Backing: Hardboard, 1/4 inch thick, laminated to tack surface.
5. Size: As indicated on drawings.
6. Frame: Extruded aluminum , with concealed fasteners.
7. Frame Finish: Anodized, natural.

C. Combination Units and Units Made of More Than One Panel: Factory-assembled markerboards and tackboards in a single frame, of materials specified above.
1. Join panels of different construction with H-shaped extruded aluminum molding finished to match frame.
2. Join panels of similar construction with butt joints, aligned and secured with steel spline concealed in edge of core.
3. Configuration: As indicated on drawings.

2.03 DISPLAY CASES

A. Manufacturers:
1. Tablet & Ticket Co.: www.tabletandticket.com
2. Substitutions: See Section 01 6000 - Product Requirements.

B. Basis of Design: 900GR-PVT as manufactured by Tablet & Ticket Co.
1. Construction: Complete semi recessed Case, with 3/8” or 1/2" tempered glass (verify size of door) pivot hinged doors, with a 2.5" aluminum framing on the top and bottom of display case doors only (no vertical support members on glazing or doors or display case frame), glass returns if required, aluminum trim bar on bottom, all vertical edges of glass are polished, tempered glass shelves on hanging wire system. Units come completely assembled and wired. No knocked down units will be accepted.
2. Usage: Type A-Interior.
3. Mounting: Type: Semi - Recess Mounted, with 3/8” glass returns.
4. Dimensions: As shown on drawings.
5. Glazing: Type 3/8" or 1/2" tempered glass (verify size of door) thick clear tempered pivot hinged doors , horizontally tempered (no tong marks) Polished vertical edges, no vertical support members on glass doors.
6. Finish: Color anodized aluminum as scheduled.
7. Lighting Type: LED recessed downlight with remote driver box furnished by the manufacturer as part of the assembly.
8. Shelving: Hanging 3/8” tempered glass shelves on adjustable brushed aluminum wire holders all edges polished.
9. Depth of Shelving: Per Drawings.
10. Edge work: All edges polished .
11. Background Location: As indicated on the drawings.

12. Background Type: As indicated on the drawings.
13. Locks: Key Locks.

2.04 MATERIALS

A. Porcelain Enameled Steel Sheet: ASTM A424/A424M, Type I, Commercial Steel, with fired-on vitreous finish.

B. Hardboard for Cores: ANSI A135.4, Class 1 - Tempered, S2S (smooth two sides).

C. Medium Density Fiberboard (MDF): ANSI A208.2; composed of wood fibers pressure bonded with manufacturer's recommended adhesive to suit application.

D. Steel Sheet Backing: 28 gage, 0.0149 inch, galvanized.

E. Adhesives: Type used by manufacturer.

2.05 ACCESSORIES

A. Each board to have bottom tray rail and top 2” map rail. Each board to have min 4 spring clip hangers, 2 flag holders, and 2 roller brackets.

2.06 ACCESSORIES

A. Map Rail: Extruded aluminum, manufacturer's standard profile, with cork insert and runners for accessories; 1 inch wide overall , full width of frame.

B. Map Supports: Formed aluminum sliding 2 roller brackets and 4 spring clip hangers to fit map rail.

C. (2) Flag Holders: Cast aluminum bored to receive 1 inch diameter flag staff, bracketed to fit top rail of board. Omit marker tray in all "Activity Rooms", "Corridors" "Exterior Applications" and "Gymnasiums."

D. Flags: 2 Flags shall be provided for each board. Coordinate flags required before ordering.

E. Marker Tray: Aluminum, manufacturer's standard profile, one piece full length of markerboard, molded ends, concealed fasteners, same finish as frame.

F. Mounting Brackets: Concealed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated on shop drawings.

B. Verify that internal wall blocking is ready to receive work and positioning dimensions are as instructed by the manufacturer.

3.02 PREPARATION

A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install the work of this Section in strict accordance with the original design, the approved Shop Drawings, and the manufacturer's recommended installation procedures as approved by the Architect, anchoring all components firmly into position for long life under hard use, this includes wall anchors at 2’-0” o.c. and wall adhesive at maximum of 16” o.c.e.w.

B. Install with top of the marker tray at 15-48 inches above finished floor. Verify actual height with Owner before installation as required to accommodate writing, projection and viewing surface.

C. Secure units level and plumb.

D. Butt Joints: Install with tight hairline joints.

3.04 CLEANING

A. Clean board surfaces in accordance with manufacturer's instructions.

B. Cover with protective cover, taped to frame.

C. Remove temporary protective cover at Date of Substantial Completion.

END OF SECTION

SECTION 10 1400
SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Room and door signs.

B. Building, Wayfinding and Title Signs.

C. Plaque.

D. Double-Sided Electronic Message Sign.

1.02 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. 2012 TAS - Texas Accessibility Standards; 2012.

C. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

D. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.

C. Shop Drawings:
   1. Submit shop drawings showing each typical room and door sign type for fabrication, including typical drawings and details for each type to be provided.
   2. Submit shop drawings showing all graphic, wayfinding or other "special" signage for fabrication, including drawings and details for each to be provided.
   3. Shop drawings shall include plan location, directional information, size, font, color, mounting details, and scaled representation of configuration for each sign (included, but not limited to, building signs, directional/ wayfinding signs, and plaques) and graphic elements.

D. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
   1. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
   2. Request content of signs from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
   3. Submit for approval by Owner through Architect prior to fabrication.

E. Building signage, including, but not limited to, directional/ wayfinding signs, plaques, graphic elements and marquee signs:
   1. ALL signage shall be submitted for approval by the Owner for content, color, size and other physical qualities.
   2. ALL signage shall not be fabricated or installed without the written approval of the Owner.

F. Samples: Submit two samples of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.

G. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.

H. Verification Samples: Submit samples showing colors specified.

I. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Section 01 6000 - Product Requirements.

B. Package signs as required to prevent damage before installation.

C. Package room and door signs in sequential order of installation, labeled by floor or building.

D. Store tape adhesive at normal room temperature.

1.06 FIELD CONDITIONS

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain this minimum temperature during and after installation of signs.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a one year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Room and Door Signs:
1. Apco Architectural Signs: www.apco.com
2. ASI Signage: www.asisignage.com.
3. Benchmark Signs: www.benchmarksigns.biz.
4. Best Sign Systems, Inc.: www.bestsigns.com.
5. Bayuk Graphic Systems, Inc.: www.bayukgraphics.com.
6. Cosco Industries: www.coscoarchitecturalsigns.com.
7. FASTSIGNS: www.fastsigns.com.
8. Inpro: www.inprocorp.com.
9. Kroy Sign Systems: www.kroysignsystems.com.
10. Mohawk Sign Systems, Inc.: www.mohawksign.com.
11. South Texas Graphic Specialties, Inc.: www.stxgraphics.com.
12. Substitutions: See Section 01 6000 - Product Requirements.

B. Building, Wayfinding and Title Signs:
1. Cosco Industries: www.coscoarchitecturalsigns.com.
2. FASTSIGNS: www.fastsigns.com.
3. Inpro: www.inprocorp.com.
4. A.R.K. Ramos Signage Systems: www.arkramos.com.
5. ASI Signage: www.asisignage.com.
6. Best Sign Systems, Inc.: www.bestsigns.com
7. Gemini Inc.: www.geminisignproducts.com
8. The Southwell Company: www.southwellco.com.
9. Substitutions: See Section 01 6000 - Product Requirements.

C. Double-Sided Electronic Message Sign.
1. Daktronics, Inc.: www.daktronics.com.
2. The Spectrum Corporation: www.spectrumscoreboards.com.
3. Substitutions: See Section 01 6000 - Product Requirements.

D. Plaques:
   1. Cosco Industries: www.coscoarchitecturalsigns.com.
   2. Impact Signs: www.impactsigns.com
   3. The Southwell Company: www.southwellco.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 SIGNAGE APPLICATIONS

A. Accessibility Compliance: Signs are required to comply with ADA Standards, 2012 TAS, ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.

B. Room and Door Signs: Provide a sign for every doorway, whether it has a door or not, not including corridors, lobbies, and similar open areas.
   1. Sign Type: Flat signs with extruded acrylic panel media as specified.
   2. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.
   3. All letters, numbers and/or symbols shall contrast with their background. Characters and background shall have a non-glare finish.
   4. Background color as selected by architect from manufacturer’s actual color samples.
   5. Letterform shall be Helvetica Regular upper case letters and numbers.
   6. Size of letters and numbers shall be as detailed on the drawings.
   7. Provide solid cover plate for back side of sign where mounted to glass.
   8. Entry/Exit Numbering: Provide 4" high door number on each side of all exterior doors for First Responder information. Numbers shall start at main primary entry and continue sequence in clockwise direction around the building.
   9. Exterior Room Identification Signage
      a. Provide cast aluminum sign with raised letters and border.
      b. Raised letters and border shall be satin finish with painted background.
      c. Signs shall have room function followed by Grade 2 Braille directly below.
      d. Provide at all exterior mechanical, electrical, fire riser rooms or other exterior locations.

C. Code Required Signage: Fire Protection and Utility Equipment Identification Access and Emergency Signage. See "Schedules" article below.

D. Building, Wayfinding and Title Signs:
   1. Building Letters.
      a. Use individual cast aluminum alloy, smooth surface letters.
      b. Letters shall be Arial for bidding purposes unless noted otherwise on the drawings.
      c. Finish shall be baked enamel, primed and spray coated with two (2) coats of baked enamel.
      d. Reference drawings for font heights and locations.
      e. Font and finish are for bidding purposes only. Submit samples to Architect for approval before fabrication of any material
      f. Provide (5) 8" high numbers for the building address. Verify location with Building Inspector. Color shall be contrasting to building. Provide one set per building.
   2. Custom Reverse Channel, Backlit Fabricated Letters:
      a. Lighting: Provide manufacturers standard LED lighting system including all transformers, J-boxes wiring and other components for a complete installation.
      b. Letter Characteristics
         1) Metal: Aluminum
         2) Thickness: Letter depth = 1”
         3) Letterstyle: Fabricated Aluminum Letter. Letters shall be Arial for bidding purposes. Verify actual font with Owner prior to fabrication.
         4) Finish: As selected from manufacturer’s full range.

5) Mounting: PM-1
6) Reference drawings for font heights and locations.

3. Custom Backlit Dimensional Signage:
   a. Lighting: Provide manufacturers standard LED lighting system including all transformers, J-boxes wiring and other components for a complete installation.
   b. Precision Cut Letters and Logo's
      1) Metal: Aluminum
      2) Thickness: 1/4”
      3) Finish: As selected from manufacturer’s full range.
      4) Reference drawings for graphics and locations.
   c. Mount on wall in location indicated on drawings.
4. Illuminated Fabricated Letters: Laser cut using computer-guided equipment.
   a. Material: Fabricated aluminum channel letters with illuminated acrylic face sheet insert recessed 1" from face of aluminum.
   b. Letter Height and Depth: Reference drawings.
   c. Letter Construction: Fabricated Aluminum faces are produced with .090” aluminum. Returns are produced with .063” aluminum.
   d. Letterstyle: Fabricated Aluminum Letter. Letters shall be Nova Bold for bidding purposes. Reference drawings and verify actual font with Owner prior to fabrication.
   e. Finish: Powder coated aluminum and painted acrylic as selected from manufacturer’s full range.
   f. Lighting: Provide manufacturers standard LED lighting system including all transformers, J-boxes wiring and other components for a complete installation.
   g. Mounting: Provide stud mounting with spacers as required for proper projection from wall, coordinated with wall construction. Reference drawings for additional information.
5. Custom Vinyl Graphics
   a. Laser cut vinyl letters/graphics where shown on the drawings
      1) Multi Die Cut production and Single Die Cut production. Adhesive backing adhered to walls and glass.
   b. Mount on wall in location shown on drawings.
6. All exterior wall, roof, and structure mounted letters/signs to be engineered by the sign manufacturer for mounting requirements and structural connections in accordance with the applicable wind loading and building codes. Sign manufacturer shall coordinate with adjacent building trades for connection requirements prior to other building elements being installed.

E. Plaques:
   1. Provide 1 stainless steel plaque per building.
      a. Design shall be as detailed in this section.
      b. Tablet to be 18" x 18”. ¼” thickness.
      c. The plaque shall be etched stainless steel background, free of all pits and gas holes, with raised borders and characters. All characters shall be sharp.
      d. Border and faces of raised characters are to be a polished finish and background is to be brushed finish.
      e. The plaque shall contain the names of the Superintendent of Schools, School Board members, the Architect, the Contractor, the Year and Title of the Building. Names and all edits to be given by Owner. If the size is not large enough to accommodate all the information given above, the plaque size shall be increased accordingly to 18” x 24”.
   2. Mount the plaque where directed by the Architect.

F. Double-Sided Electronic Message Sign:

1. Basis of Design: Daktronics, Galaxy GT6x Series 10 mm, two-sided electronic message sign with electronic control software. See drawings for configurations and dimensions.
2. Display Capabilities:
   a. The display shall contain a full LED matrix.
   b. The LED display shall be capable of producing 281 trillion colors for RGB at all dimming levels.
   c. The display shall be able to display messages composed of any combination of alphanumeric text, punctuation symbols, graphic images, and pre-canned video files.
3. Communication:
   a. Ethernet Cellular Modem.
4. Control Software:
   a. Display content and scheduling shall be via a cloud-based solution. Software to be web browser access and hosted on manufacturer's servers at no cost to the Owner.

2.03 ACCESSORIES

A. Tape Adhesive: Double sided tape and clear silicone adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.
   1. Examine work area with installer present.
   2. If existing conditions are not as required to properly complete the work of this section, notify Architect.
   3. Do not proceed with installation until deficiencies in existing conditions have been corrected.

B. Verify that dimensions, tolerances, and attachment methods for work in this section are properly coordinated with other work on site.

3.02 INSTALLATION

A. Interior/Exterior Room and Door Signage
   1. Install in accordance with manufacturer's instructions.
   2. Install neatly, with horizontal edges level.
   3. Locate signs where indicated:
      a. Room and Door Signs: Contractor shall locate specific mounting heights in coordination with the current TAS and ADA regulations. Mount sign on wall or glass.
      b. If no location is indicated obtain Owner's instructions.
      c. Wall or Glass Mounted: Double sided vinyl tape and clear silicone adhesive. Provide solid cover plate for back side of sign for glass installations.
   4. Protect from damage until Date of Substantial Completion; repair or replace damaged items.

B. Building Identification Signage
   1. General: locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions.
   2. Install signs level, plumb, and at the height indicated with sign surfaces free from distortion or other defects in appearance.
   3. Cleaning and Protection: After installation, clean soiled sign surfaces according to the manufacturer's instructions. Protect units from damage until acceptance by the owner.

C. Electronic Message Sign
   1. Comply with provisions of Section 01 7000 - Execution and Closeout Requirements
   2. Install sign in accordance with manufacturer's instructions.
   3. Install units plumb and level, in locations shown. Securely attach to supporting structure with concealed fasteners, according to manufacturer's written installation instructions.

3.03 SCHEDULES

A. Interior/Exterior Room and Door Signage:
   1. ID signs with room number with one window slot. Window insert shall be fixed.
      a. Locations – Classrooms, offices.
   2. ID signs with room number and function.
      a. Locations – All locations except classrooms, offices.
      b. Provide “Roof Access” sign to rooms housing roof access hatch and ladder
      c. Provide “Maximum Occupancy” signs at the following locations;
         1) Lecture Hall
         2) Cafeteria
         3) Auditorium
         4) Gymnasium
         5) Activity Room
      d. Provide "Exterior Room Identification Signage" at all exterior mechanical, electrical and fire riser rooms.
   3. Restroom signs with accessibility and gender symbol with the verbal description placed directly below and followed by Grade 2 braille.
   4. Pictogram signs with accessibility and function symbol with the verbal description placed directly below and followed by Grade 2 braille.
      a. Messages: Text will be room names as directed by the Architect.
      b. Provide signage outside each assembly entrance stating ”Assistive Listening Devices Available” with the international symbol of access for hearing loss.
      c. Locations – Auditoriums, Distant Learning Rooms, Cafeterias, and Gymnasiums

B. Code Required Signage.
   1. Fire Protection Equipment Identification, exterior access.
      a. Location(s): Permanently installed and readily visible. Verify mounting location with AHJ.
         1) Fire Suppression Sprinkler Riser and Valve Rooms.
      b. Copy: "RISER ROOM".
      c. Color: Copy to be White in contrast to its Red background.
   2. Fire Protection and Utility Equipment Identification, interior access.
      a. Location(s): Verify mounting location with AHJ.
         1) Air-Conditioning Systems Control Rooms.
         2) Fire Suppression Sprinkler Riser and Valve Rooms.
         3) Fire Detection, Suppression or Control.
      b. Copy: For bidding purposes, use room name as indicated on drawings. Verify final copy with Architect prior to fabrication.
      c. Color: Copy to be in contrast to its background.
   3. Elevator Lobby Emergency Signs: Provide one standardized design posted adjacent to each elevator call station on all floors. Copy: "IN CASE OF FIRE, ELEVATORS ARE OUT OF SERVICE. USE EXIT STAIRS".
   4. Raised Character and Braille Exit Signs: A sign stating "EXIT" in visual characters, raised characters and braille and complying with ICC A117.1 shall be provided adjacent to each door to an area of refuge, providing direct access to a stairway, an exterior area for assisted rescue, an exit stairway or ramp, an exit passageway and the exit discharge.

C. **Plaque Example:**

END OF SECTION

SECTION 10 2113.17
PHENOLIC TOILET COMPARTMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Color-thru Solid Phenolic Toilet Compartments.

B. Urinal screens.

C. shower and dressing compartments.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Blocking and supports.

B. Section 10 2800 - Toilet, Bath, and Laundry Accessories.

1.03 REFERENCE STANDARDS

A. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the work with placement of support framing and anchors in walls and ceilings.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on panel construction, hardware, and accessories.

C. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.

D. Samples: Submit two samples of partition panels, 6 by 6 inch in size illustrating panel finish, color, and sheen.

E. Manufacturer's Installation Instructions: Indicate special procedures.

1.06 WARRANTY

A. Manufacturer's Warranty: Manufacturer's standard 25 year limited warranty for panels, doors, and stiles against breakage, corrosion, delamination, and defects in factory workmanship. Manufacturer's standard 1 year guarantee against defects in material and workmanship for stainless steel door hardware and mounting brackets

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Color-thru Solid Phenolic Toilet Compartments:
   1. ASI Accurate Partitions: www.asi-accuratepartitions.com/#sle.
   2. ASI Global Partitions: www.asi-globalpartitions.com/#sle.
   3. Bobrick Washroom Equipment, Inc.: www.bobrick.com.
   4. General Partitions Mfg. Corp.: www.generalpartitions.com.
   5. Hadrian: www.hadrian-inc.com/#sle.
   6. Partition Systems International of South Carolina: www.psisc.com.
   7. Substitutions: Section 01 6000 - Product Requirements.

2.02 PHENOLIC TOILET COMPARTMENTS

A. Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid phenolic core panels with integral melamine finish, floor-mounted headrail-braced.

1. Color: As selected from manufactures full line of colors.

B. Doors:
   1. Thickness: 3/4 inch.
   2. Width: 28 inch.
   3. Width for Handicapped Use: 34 inch, out-swinging. (minimum)
   4. Width for Ambulatory Use: 34 inch, out-swinging.
   5. Height: 58 inch mounted 12" above finished floor.

C. Panels:
   1. Thickness: 3/4 inch.
   2. Height: 58 inch mounted 12" above finished floor.
   3. Top of panels shall have vandal resistant “V” shaped cap rail.
   4. Depth: As indicated on drawings.

D. Pilasters:
   1. Thickness: 3/4 inch.
   2. Width: As required to fit space; minimum 3 inch.

E. Screens: Without doors; to match compartments; mounted to wall with continuous panel brackets . Screens shall be braced with a continuous ceiling to floor stainless steel brace at front face of screen.
   1. Thickness: 3/4 inch.
   2. Height: 58 inch mounted 12" above finished floor.
   3. Depth: 22 inches.

F. National Fire Protection Association/International Building Code Interior Wall and Ceiling Finish: Class B / Uniform Building Code: Class II.
   1. Flame Spread Index ASTM E84: 30 for panels and stiles.
   2. Smoke Developed Index ASTM E84: 55 for panels, 20 for stiles.

2.03 ACCESSORIES

A. Pilaster Shoes: Formed ASTM A666, Type 304 stainless steel with No. 6 finish, 4 inch high, concealing floor and ceiling fastenings.
   1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.
   2. Provide ceiling attachment using two adjustable hanging studs, attached to above-ceiling framing.

B. Head Rails: Hollow stainless steel, 1 inch by 1-1/2 inch size, with anti-grip profile and cast socket wall brackets.

C. Wall and Pilaster Brackets: Satin stainless steel; manufacturer's standard type for conditions indicated on drawings.

D. Attachments, Screws, and Bolts: Stainless steel , tamper proof type.
   1. For attaching panels and pilasters to brackets: Through-bolts and nuts ; tamper proof.

E. Hardware: Brushed Stainless Steel:
   1. Provide continuous heavy-duty stainless-steel gravity type hinges on all restroom partitions.
   2. Provide heavy-duty brushed solid stainless-steel slide-type locks on all restroom partitions. Provide pulls on opposite side of latch.
   3. Coat hook with rubber bumper; one per compartment at women's stall only, mounted on door.
   4. Provide door pull for outswinging doors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify correct spacing of and between plumbing fixtures.

C. Verify correct location of built-in framing, anchorage, and bracing.

3.02 INSTALLATION

A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.

B. Maintain 3/8 inch to 1/2 inch space between wall and panels and between wall and end pilasters.

C. Attach panel brackets securely to walls using anchor devices.

D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

E. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

3.03 TOLERANCES

A. Maximum Variation From True Position: 1/4 inch.

B. Maximum Variation From Plumb: 1/8 inch.

3.04 ADJUSTING

A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.

B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.

C. Adjust adjacent components for consistency of line or plane.

END OF SECTION

SECTION 10 2123
CUBICLE CURTAINS AND TRACK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended overhead curtain track and guides.

B. Surface mounted overhead curtain track and guides.

C. Cubicle curtains.

1.02 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: Owner-installed curtains.

B. Section 05 5000 - Metal Fabrications: Track supports above ceiling.

C. Section 06 1000 - Rough Carpentry: Blocking and supports for track.

D. Section : Suspended ceiling system to support track.

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023.

B. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2015.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for curtain fabric characteristics.

C. Shop Drawings: Indicate a reflected ceiling plan view of curtain track, hangers and suspension points, attachment details, schedule of curtain sizes.

D. Samples: Submit two fabric samples, 12 by 12 inch in size illustrating fabric color.

E. Samples: Submit 12 by 12 inch sample patch of curtain cloth with representative top, bottom, and edge hem stitch detail, heading with reinforcement and carrier attachment to curtain header.

F. Samples: Submit 12 inch sample length of curtain track including typical splice, wall and ceiling hanger, and escutcheon.

G. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention .

H. Maintenance Data: Include recommended cleaning methods and materials and stain removal methods.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Curtains: One of each type and size.
   3. Extra Carriers: Five.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept curtain materials on site and inspect for damage.

B. Store curtain materials on site and deliver to Owner for installation when requested.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Cubicle Track and Curtains:
   1. A. R. Nelson Co: www.arnelson.com.
   2. C/S General Cubicle: www.c-sgroup.com/cubicle-track-curtains.

3. Imperial Fastener Co., Inc: www.imperialfastener.com.
4. Inpro: www.inprocorp.com.
5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 TRACKS AND TRACK COMPONENTS

A. Tracks: Extruded aluminum sections; one piece per track run.
1. Profile: Channel.
2. Mounting: Surface.
3. Structural Performance: Capable of supporting vertical test load of 50 lbs without visible deflection of track or damage to supports, safely supporting moving loads, and sufficiently rigid to resist visible deflection and without permanent set.
4. Track End Stop, Tees, Y's, and Switches: to fit track section. Provide one removable end closer per track to permit entry and removal of carriers.
5. Track Bends: Minimum 12 inch radius; fabricated without deformation of track section or impeding movement of carriers.
6. Suspension Rods: Tubular aluminum sections, sized to support design loads and designed to receive attachment from track and ceiling support.
7. Escutcheons: Where suspension rod meets finished ceiling or structure, provide escutcheons to match rod finish.
8. Finish on Exposed Surfaces: Clear anodized.

B. Curtain Carriers: Nylon rollers, size and type compatible with track; designed to eliminate bind when curtain is pulled; fitted to curtain to prevent accidental curtain removal.

C. Wand: Plastic, attached to lead carrier, for pull-to-close action.

D. Installation Accessories: Types required for specified mounting method and substrate conditions.

2.03 CURTAINS

A. Cubicle Curtains:
1. Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
2. Inherently flame resistant or flameproofed; capable of passing NFPA 701 test.
3. Material: Close weave polyester; anti-bacterial, self deodorizing, sanitized, and preshrunk.

B. Curtain: Reference Schedule of Materials for selected fabric; color as selected.

C. Open Mesh Cloth: Open weave to permit air circulation; flameproof material, manufacturer's standard color.

D. Curtain Fabrication:
1. Width of curtain to be 10 percent wider than track length.
2. Include open mesh cloth at top 20 inches of curtain for room air circulation, attached to curtain as specified above.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and supports above ceiling are ready to receive work of this Section.

B. Verify that field measurements are as indicated.

3.02 INSTALLATION

A. Install curtain track to be secure, rigid, and true to ceiling line.

B. Secure track to ceiling system. Provide above ceiling reinforcement for entire length of curtain.

C. Install curtains on carriers ensuring smooth operation.

3.03 SCHEDULES

A. Provide at Nurses stations and where indicated on drawings.

END OF SECTION

SECTION 10 2239
FOLDING PANEL PARTITIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Top-supported folding panel partitions, horizontal opening.

B. Ceiling track and operating hardware.

1.02 RELATED REQUIREMENTS

A. Section : Wood blocking and track support shimming.

B. Section 08 7100 - Door Hardware: Lock cylinders for panels

1.03 REFERENCE STANDARDS

A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

B. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

C. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

D. ASTM E413 - Classification for Rating Sound Insulation; 2016.

E. ASTM E557 - Standard Guide for Architectural Design and Installation Practices for Sound Isolation Between Spaces Separated by Operable Partitions; 2012 (Reapproved 2026).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene at project site seven calendar days prior to scheduled beginning of construction activities of this section to review section requirements.
   1. Require attendance by representatives of installer.
   2. Notify Architect four calendar days in advance of scheduled meeting date.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on partition materials, operation, hardware and accessories, track switching components, and colors and finishes available.

C. Shop Drawings: Indicate opening sizes, track layout, details of track and required supports, and stacking depth.

D. Samples for Selection: Submit two samples of full manufacturer's color range for selection of colors.

E. Samples for Review: Submit two samples of surface finish, 12 by 12 inches size, illustrating quality, colors selected, texture, and weight.

F. Certificates: Certify that partition system meets or exceeds specified acoustic requirements.

G. Manufacturer's Instructions: Indicate special procedures, perimeter conditions requiring special attention, and installation sequence.

H. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods. Describe cleaning materials detrimental to finish surfaces and hardware finish.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience and approved by manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until installation.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within two year period after Date of Substantial Completion.

C. Provide two year manufacturer warranty against defects in material and workmanship, excluding abuse.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Folding Panel Partitions - Horizontal Opening:
   1. Kwik-Wall Company; 3000 Series: www.kwik-wall.com/#sle.
   2. Moderco, Inc; Signature Series: www.moderco.com/#sle.
   3. Modernfold, a DORMA Group Company; Encore Series: www.modernfold.com/#sle.

2.02 FOLDING PANEL PARTITIONS - HORIZONTAL OPENING

A. Folding Panel Partitions: Side opening; paired panels; center stacking; manually operated.

B. Panel Construction:
   1. Frame: 16 gauge, 0.0598 inch thick formed sheet steel frame top, bottom, jambs, and intermediates; welded construction.
   2. Substrate: Gypsum board.
   3. Panel Substrate Facing: Steel sheet, manufacturer's standard thickness.
   4. Hardware: Latching door handles of material, and finish to match remainder of project; lock cylinder keyed to building keying system.
      a. Refer to Section 08 7100 for additional requirements.
      b. Provide pass door with panic hardware where required per code - minimum 1 required.
   5. Panel Properties:
      a. Thickness With Finish: 4 inches m.
      b. Width: Standard width.
      c. Weight: 8-11 lb/sq ft. based on STC rating.

C. Panel Finishes:
   1. Facing: Markerboard both sides.
   2. Exposed Metal Trim: As scheduled in Section 01 6210.

D. Panel Seals:
   1. Panel to Panel Seals: Grooved and gasketed astragals, with continuous flexible ribbed vinyl seal fitted to panel edge construction; color to match panel finish.
   2. Acoustic Seals: Flexible acoustic seals at jambs, meeting mullions, ceilings, retractable floor and ceiling seals, and above track to structure acoustic seal.

E. Suspension System:
   1. Track: Formed steel; Minimum 1-1/4 by 1-1/4 inch size; thickness and profile designed to support loads, steel sub-channel and track connectors, and track switches.
   2. Carriers: Nylon wheels on trolley carrier at top of every second panel, sized to carry imposed loads, with threaded pendant bolt for vertical adjustment.

F. Performance:
   1. Acoustic Performance:

a. Sound Transmission Class (STC): 52 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90, on panel size of 100 sq ft.

2. Installed partition system track capable of supporting imposed loads, with maximum deflection of 1/360 of span.

G. Accessories:

1. Acoustic Sealant: As recommended by partition manufacturer.

2.03 MATERIALS

A. Aluminum Extrusions: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

B. Markerboard: Porcelain enamel on steel, laminated to core.

C. Acoustic Insulation:

1. Type: As required for acoustic performance indicated.
2. Thickness: As required for acoustic performance indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated on shop drawings.

B. Verify track supports are laterally braced and will permit track to be level within 1/4 inch of required position and parallel to the floor surface.

C. Verify floor flatness of 1/8 inch in 10 feet, non-cumulative.

D. Verify wall plumbness of 1/8 inch in 10 feet, non-cumulative.

3.02 INSTALLATION

A. Install partition in accordance with manufacturer's instructions and ASTM E557.

B. Fit and align partition assembly level and plumb.

C. Lubricate moving components.

D. Install acoustic sealant to achieve required acoustic performance.

E. Coordinate electrical connections.

3.03 ADJUSTING

A. Adjust partition assembly to provide smooth operation from stacked to full open position. Do not over-compress acoustic seals.

B. Visually inspect partition in full extended position for light leaks to identify a potential acoustical leak.

C. Adjust partition assembly to achieve lightproof seal.

3.04 CLEANING

A. Clean finish surfaces and partition accessories.

B. Condition markerboard surfaces in accordance with manufacturer's instructions.

3.05 CLOSEOUT ACTIVITIES

A. Demonstrate operation of partition and identify potential operational problems.

END OF SECTION

SECTION 10 2241
OPERABLE GLASS PARTITIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Operable glass partitions, manually operated.

1.02 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).

B. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

C. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

D. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

F. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

G. ASTM B455 - Standard Specification for Copper-Zinc-Lead Alloy (Leaded-Brass) Extruded Shapes; 2010 (Reapproved 2017).

H. ASTM B455/B455M - Standard Specification for Copper-Zinc-Lead Alloy (Leaded-Brass) Extruded Shapes; 2020.

I. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

J. ASTM C1036 - Standard Specification for Flat Glass; 2021.

K. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

L. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

1.03 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene at project site seven calendar days prior to scheduled beginning of construction activities of this section to review section requirements.
   1. Require attendance by representatives of installer.
   2. Notify Architect four calendar days in advance of scheduled meeting date.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's descriptive literature for each component in partition assembly.

C. Shop Drawings: Indicate layout, dimensions, identification of components, and interface with adjacent construction.
   1. Include field measurements of openings.
   2. Include elevations showing:
      a. Locations and identification of manufacturer-supplied door hardware and fittings.
      b. Locations and sizes of cut-outs and drilled holes for other door hardware.
   3. Include details of:
      a. Requirements for support and bracing of overhead track.

b. Installation details.
c. Appearance of manufacturer-supplied door hardware and fittings.

D. Selection Samples: Two sets, representing manufacturer's full range of available metal materials and finishes.

E. Verification Samples: Two samples, minimum size 2 by 3 inches, representing actual material and finish of exposed metal.

F. Certificates: Contractor to certify that installer of partition assemblies meets specified qualifications.

G. Operation and Maintenance Data: For manufacturer-supplied operating hardware.

H. Manufacturer's Installation Instructions: Include complete preparation, installation, and cleaning requirements.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Minimum three years of experience designing, assembling, and installing partition assemblies similar to those specified in this section.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until installation.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a two year period after Date of Substantial Completion.

C. Provide two year manufacturer warranty against excessive degradation of metal finishes. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manually-Operated Glass Operable Partitions:
1. Kwik-Wall Company: www.kwik-wall.com/#sle.
2. Moderco, Inc: www.moderco.com/#sle.
3. Modernfold, a DORMA Group Company: www.modernfold.com.
4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 OPERABLE GLASS PARTITIONS

A. Operable Glass Partitions - Framed: Top hung, factory fabricated assemblies consisting of double-glazed framed glass panels in configuration indicated on drawings.
1. Frame Finish: See Schedule of Materials and Colors..
2. Tempered Glass Thickness: 1/2 inch.
3. Maximum Support Capacity: Manufacturers standard load.
4. Glass: Clear.
5. Panel hardware finish to match frame.
6. Designed to withstand normal operation without damage, racking, sagging, or deflection.
7. Finished metal surfaces protected with strippable film.
8. Factory assembled to greatest extent practicable; may be disassembled to accommodate shipping constraints.

B. Acoustical Performance
1. Acoustical performance shall be tested at an independent laboratory in accordance with ASTM E90 Test Standards. Standard panel construction shall have obtained a minimum STC rating of 44.

C. Overhead Track: Extruded aluminum box track, factory fabricated; corner, intersection, and hanger access fittings to suit partition movement and stacking indicated; track joints reinforced with stainless steel junction plates.
   1. Overhead Track Finish: Clear anodized.
   2. Track Suspension System: Provide brackets, hanger rods, and hardware for attachment to structure, with at least 6 inch vertical adjustment range and capable of adjustments without removing panels from tracks.

D. Track Hangers: 4-wheeled, ball-bearing, stainless steel rollers on vertical axles; two per panel; providing smooth movement and directional control, and preventing accidental panel rotation.

E. Operable Panel Hardware:
   1. Lever handle with profile cylinder, manufacturer's standard.

F. Other Hardware: Specified in Section 08 7100.

G. Acoustic Seals: Provide acoustic seals in accordance with project requirements.

H. Pass Door: Single door, 36 inch wide by 84 inch high opening; same design and construction as panel; fit door with perimeter acoustic gaskets, concealed closer, and keyed lock. Provide pass door with panic hardware where required per code - minimum 1 required.

2.03 MATERIALS

A. Glass: Tempered float glass meeting requirements of ASTM C1036, Type I, Quality Q3, fully tempered in accordance with ASTM C1048, Kind FT, and as follows:
   1. Prepare glazing panels for indicated fittings and hardware before tempering.
   2. Provide exposed glazing edges with flat polished/ground glass finish.
   3. Temper glass materials horizontally; visible tong marks or tong mark distortions are not permitted.

B. Aluminum Components: Complying with ASTM B221 (ASTM B221M), alloy 6063, temper as indicated, with anodized finish complying with AAMA 611, and powder coating complying with AAMA 2603 or AAMA 2604 for select colors.

C. Stainless Steel Components: Complying with ASTM A666/A666M, Type 304.

D. Brass Components: Complying with ASTM B455/B455M, UNS C38500, Architectural Bronze.

E. Sealant: One-part silicone sealant, complying with ASTM C920, clear.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated on shop drawings.

B. Verify track supports are laterally braced and will permit track to be level within 1/4 inch of required position and parallel to the floor surface.

C. Verify floor flatness of 1/8 inch in 10 feet, non-cumulative.

D. Do not begin installation until supports and adjacent substrates have been properly prepared.

E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean substrates thoroughly prior to installation.

B. Prepare substrates using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install in accordance with track and fitting manufacturer's instructions.

B. Fit and align partition assembly level and plumb.

C. The complete installation of the operable wall system shall be by an authorized factory-trained installer and be in strict accordance with the approved shop drawings and manufacturer's standard printed specifications, instructions, and recommendations.

3.04 ADJUSTING

A. Adjust partition to operate smoothly from stacked to fully extended position.

B. Adjust swing door hardware for smooth operation.

3.05 CLEANING

A. Thoroughly clean surfaces and materials installed as part of this work.

3.06 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. Demonstrate operation of partition and identify potential operational problems.

3.07 PROTECTION

A. Protect installed products and materials until Date of Substantial Completion.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 10 2600
WALL AND DOOR PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Corner guards.

1.02 RELATED REQUIREMENTS

A. Section 09 2116 - Gypsum Board Assemblies: Placement of supports in stud wall construction.

1.03 REFERENCE STANDARDS

A. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2010 (Reapproved 2018).

B. ASTM D543 - Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents; 2020.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023.

D. ASTM F476 - Standard Test Methods for Security of Swinging Door Assemblies; 2023.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Indicate physical dimensions, features, wall mounting brackets with mounted measurements, anchorage details, and rough-in measurements.

C. Shop Drawings: Include plans, elevation, sections, and attachment details.

D. Samples: Submit samples illustrating component design, configurations, joinery, color and finish.
   1. Submit two sections of corner guards, 6 inches long.

E. Manufacturer's Instructions: Indicate special procedures, perimeter conditions requiring special attention.

F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

G. Maintenance Data: Manufacturer's instructions for care and cleaning of each type of product. Include information about both recommended and potentially detrimental cleaning materials and methods.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver wall and door protection items in original, undamaged protective packaging. Label items to designate installation locations.

B. Protect work from moisture damage.

C. Protect work from UV light damage.

D. Do not deliver products to project site until areas for storage and installation are fully enclosed, and interior temperature and humidity are in compliance with manufacturer's recommendations for each type of item.

E. Store products in either horizontal or vertical position, in compliance with manufacturer's instructions.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a one year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Corner Guards:
   1. Babcock-Davis: www.babcockdavis.com/#sle.
   2. Construction Specialties, Inc: www.c-sgroup.com/#sle.
   3. Inpro: www.inprocorp.com/#sle.
   4. Koroseal Interior Products: www.koroseal.com/#sle.
   5. Nystrom, Inc: www.nystrom.com/#sle.
   6. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PERFORMANCE CRITERIA

A. Impact Strength: Unless otherwise noted, provide protection products and assemblies that have been successfully tested for compliance with applicable provisions of ASTM D256 and/or ASTM F476.

B. Chemical and Stain Resistance: Unless otherwise noted, provide protection products and assemblies with chemical and stain resistance complying with applicable provisions of ASTM D543.

2.03 PRODUCT TYPES

A. Corner Guards - Surface Mounted:
   1. Material: Polyethylene terephthalate (PET or PETG); PVC-free with full height extruded aluminum retainer.
   2. Performance: Resist lateral impact force of 100 lbs at any point without damage or permanent set.
   3. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
   4. Width of Wings: 2 inches.
   5. Corner: Radiused.
   6. Color: As selected from manufacturer's standard colors.
   7. Length: One piece.
   8. Preformed end caps.

B. Adhesives and Primers: As recommended by manufacturer.

C. Mounting Brackets and Attachment Hardware: Appropriate to component and substrate.

2.04 FABRICATION

A. Fabricate components with tight joints, corners and seams.

B. Pre-drill holes for attachment.

C. Form end trim closure by capping and finishing smooth.

2.05 SOURCE QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Provide wall and door protection systems of each type from a single source and manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.

B. Verify that substrate surfaces for adhered items are clean and smooth.

C. Start of installation constitutes acceptance of project conditions.

3.02 INSTALLATION

A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.

B. Position corner guard 4 inches above finished floor to ceiling or height as indicated on drawings.

3.03 TOLERANCES

A. Maximum Variation From Required Height: 1/4 inch.

B. Maximum Variation From Level or Plane For Visible Length: 1/4 inch.

3.04 CLEANING

A. Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants.

END OF SECTION

SECTION 10 2800
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Commercial toilet accessories.

B. Commercial shower and bath accessories.

C. Under-lavatory pipe supply covers.

D. Fold down changing tables, fixed height and adjustable height.

E. Utility room accessories.

F. Owner Furnished, Contractor Installed products, (OFCI).

1.02 RELATED REQUIREMENTS

A. Section 06 1000-Rough Carpentry: Concealed supports for accessories, including in wall framing and plates and above ceiling framing.

B. Section 10 2113.19 - Plastic Toilet Compartments.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

C. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015a (Reapproved 2019).

D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

E. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

F. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium; 2017.

G. ASTM C1036 - Standard Specification for Flat Glass; 2021.

H. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

I. ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping; 2015.

J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023.

K. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015 (Reapproved 2021)e1.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

B. Provide accessories for Integrated Room Mock-ups as required in Section 01 4000-Quality Requirements.

C. Review delivery dates for Owner-Furnished products.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
   2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
   3. Include electrical characteristics.

C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
   1. Identify locations using room designations indicated.
   2. Identify accessories using designations indicated.

D. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

E. Closeout Submittals:
   1. Submit under provisions of Section 01 7800 Closeout Submittals.
   2. Maintenance Data: For accessories to include in maintenance manuals.

1.06 WARRANTY

A. Manufacturer’s Special Warranty: Manufacturer agrees to repair or replace items that fail in materials or workmanship within specified warranty period.
   1. All accessories not specifically listed otherwise, (1) year from date of Substantial Completion.
   2. Mirrors: Failures include, but are not limited to, visible silver spoilage defects; warranty period (5) years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 OWNER FURNISHED PRODUCTS

A. Owner will furnish products indicated. The work includes receiving, unloading, handling, storing, protecting, and installing Owner-Furnished products.

B. Owner-Furnished Products:
   1. Toilet Tissue (Roll) Dispenser (**T1**).
   2. Paper Towel (Roll) Dispenser (**T6**).
   3. Soap Dispenser (**T11**) or (**T12**). See drawings for mounting type required.

2.02 MANUFACTURERS

A. Commercial Toilet, Shower, and Bath Accessories:
   1. Basis of Design: Model numbers listed are per Bradley Corporation unless noted otherwise.
   2. ASI - American Specialties, Inc: www.americanspecialties.com/#sle.
   3. Bobrick Washroom Equipment, Inc.: www.bobrick.com.
   4. Bradley Corporation: www.bradleycorp.com/#sle.
   5. GAMCO – (General Accessory Mfg. Co): www.gamcousa.com.
   6. Georgia-Pacific Professional: www.blue-connect.com/#sle.
   7. Kimberly Clarke Professional: www.kcprofessional.com.
   8. Substitutions: Section 01 6000 - Product Requirements.

B. Under-Lavatory Pipe Supply Covers:
   1. Plumberex Specialty Products, Inc: www.plumberex.com/#sle.
   2. Substitutions: Section 01 6000 - Product Requirements.

C. Fold Down Changing Tables:
   1. MAX-Ability, Inc.: www.max-ability.com.
   2. Substitutions: 01 6000 - Product Requirements.

D. Utility Room Accessories:
   1. Bradley Corporation: www.bradleycorp.com.
   2. Zurn Industries, LLC: www.zurn.com.
   3. Substitutions: 01 6000 - Product Requirements.

E. Source Limitations: Provide products of each category type by single manufacturer.

2.03 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
   1. Grind welded joints smooth.
   2. Fabricate units made of metal sheet of seamless sheets with flat surfaces.

B. Keys: Provide four keys for each accessory to Owner; master key lockable accessories.

C. Stainless Steel Sheet: ASTM A666/A666M, Type 304.

D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.

E. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.

F. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.

G. Adhesive: Two component epoxy type, waterproof.

H. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof.

I. Expansion Shields: Fiber or rubber as recommended by accessory manufacturer for component and substrate.

2.04 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

B. Chrome/Nickel Plating: ASTM B456, SC 2, satin finish, unless otherwise noted.

C. Galvanizing for Items Other than Sheet: Comply with ASTM A123/A123M; galvanize ferrous metal and fastening devices.

D. Shop Primed Ferrous Metals: Pretreat and clean, spray apply one coat primer and bake.

E. Back paint components where contact is made with building finishes to prevent electrolysis.

2.05 COMMERCIAL TOILET ACCESSORIES

A. Mirrors: Stainless steel framed, (**T9**) and (**T10**): 1/4 inch thick tempered safety glass; ASTM C1048.
   1. Frame: 0.05 inchangle shapes, with mitered and welded and ground corners; satin finish.
   2. Back of unit shall be galvanized steel, secure to frame with concealed screws, equipped with integral horizontal hanging brackets and separate wall hanger for concealed mounting.
   3. Products:
      a. Basis of Design: (**T9**), Model 7802-1836, single lavatory mirror, 18” x 36”.
      b. Basis of Design: (**T10**), Model 7802-2460, full-length mirror, 24” x 60”.

B. Grab Bars, (**T4**) and (**T5**): Stainless steel, textured surface.
   1. Heavy Duty Grab Bars:
      a. Push/Pull Point Load: 250 pound-force, minimum.
      b. Dimensions: 1-1/2 inch outside diameter, minimum 0.05 inch wall thickness, exposed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
      c. Finish: Satin.
      d. Length and Configuration: As indicated on drawings.
      e. Mounting: Flanges with concealed fasteners.

f. Products:
1) Basis of Design: (**T4**), Model 8122-00136, 36 inch grab bar.
2) Basis of Design: (**T5)**, Model 8122-00142, 42 inch grab bar.

C. Combination Sanitary Napkin/Tampon Dispenser, (**T21**): Stainless steel, semi-recessed.
1. Door: Seamless 0.05 inch door with returned edges and two tumbler locks.
2. Cabinet: Fully welded, 0.03 inch thick sheet.
3. Operation: 25 cent coin required to operate dispenser. Provide locked coin box, separately keyed.
4. Minimum capacity: 30 napkins and 28 tampons.
5. Products:
a. Basis of Design: Model 4017-10-45.

D. Sanitary Napkin Disposal Unit, (**T2**): Stainless steel, with self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.
1. Mounting: Partition mounted, dual access or surface mounted; refer to drawings.
2. Products:
a. Basis of Design: Model 4721-15, partition mounted, serves two compartments.
b. Basis of Design: Model 4722-15, surface mounted.

E. Single Robe Hook (**T13**): Heavy-duty stainless steel, single-prong, rectangular-shaped bracket and backplate for concealed attachment, satin finish.
1. Products:
a. Basis of Design: Model 9114.

2.06 COMMERCIAL SHOWER AND BATH ACCESSORIES

A. Shower Curtain Rod, (**T17**): Stainless steel tube, 1 inch outside diameter, 0.04 inch wall thickness, satin-finished, with 3 inch outside diameter, minimum 0.04 inch thick satin-finished stainless steel flanges, for concealed mounting.
1. Length: Refer to drawings.
2. Products:
a. Basis of Design: Model 9538, shower curtain rod.

B. Shower Curtain, (**T17**):
1. Material: 9-oz. Nylon reinforced vinyl, 0.014 inch thick with top edge hemmed, matte finish, with antibacterial treatment, flameproof and stain-resistant.
2. Size: Minimum 2-inches wider than the opening by 78 inches high, hemmed edges.
3. Grommets: Corrosion-resistant metal; pierced through top hem on 6 inch centers.
4. Color: White.
5. Shower Curtain Hooks: Stainless steel spring wire designed for snap closure.
6. Products:
a. Basis of Design: Model 9537, shower curtain.
b. Basis of Design: Model 9536, shower curtain hooks.

C. Shower Grab Bars, (**T14**), (**T15**), (**T15A**) and (**T16**): Stainless steel, textured surface.
1. Heavy Duty Grab Bars:
a. Push/Pull Point Load: 250 pound-force, minimum.
b. Dimensions: 1-1/2 inch outside diameter, minimum 0.05 inch wall thickness, exposed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
c. Finish: Satin.
d. Length and Configuration: As indicated on drawings.
e. Mounting: Flanges with concealed fasteners.
f. Products:
1) Basis of Design: (**T14**), Model 8122-00124, 24 inch.

2) Basis of Design: (**T15**), Model 8122-0591528, L-shaped 15"x28". Refer to drawings for handing.
3) Basis of Design: (**T15A)**, Model 8122-0592436, L-shaped 24"x36". Refer to drawings for handing.
4) Basis of Design: (**T16**), Model 8122-00148, 48 inch.

D. Folding Shower Seat, (**T18**): Wall-mounted surface; welded tubular seat frame, structural support members, hinges, and mechanical fasteners of Type 304 stainless steel, reversable seat. Refer to drawings for handing.
1. Seat: Phenolic or polymeric composite one-piece seat or seat slats, of white color.
2. Size: TAS/ADA Standards compliant.
3. Products:
a. Basis of Design: Model 9569.

E. Wall-Mounted Soap Dish, (**T22**): Heavy duty, seamless stainless steel, surface-mounted with drain holes, satin finish; with concealed mechanical fastening suitable for substrate and backplate.
1. Coordinate location with grab bar to avoid conflicts.
2. Products:
a. Basis of Design: Model 9014

F. Towel Bar, (**T19**): Stainless steel, six hooks and 60-inch backplate with exposed surfaces, satin finish.
1. Mounting: Surface mounted.
2. Products:
a. Basis of Design: Model 9946.

G. Single Robe Hook (**T13**): Heavy-duty stainless steel, single-prong, rectangular-shaped bracket and backplate for concealed attachment, satin finish.
1. Products:
a. Basis of Design: Model 9114.

2.07 UNDER-LAVATORY PIPE AND SUPPLY COVERS

A. Under-Lavatory Pipe and Supply Covers (**T23**):
1. Insulate exposed drainage piping, including hot, cold, and tempered water supplies under lavatories or sinks to comply with TAS/ADA Standards.
2. Exterior Surfaces: Smooth non-absorbent, non-abrasive surfaces.
3. Construction: 1/8 inch flexible PVC.
a. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
b. Comply with ASTM C1822, type indicated.
c. Microbial and Fungal Resistance: Comply with ASTM G21.
4. Color: White.
5. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces.
6. Products:
a. Basis of Design: Plumberex Specialty Products, Inc; Plumberex Handy-Shield Maxx: www.plumberex.com/#sle.

2.08 FOLD DOWN CHANGING TABLES

A. Fixed Height Wall Mounted Fold Down Changing Station, (**T27**):
1. Length: 75.25"
2. Width: 31"
3. Fixed Mounting Height: Verify with Owner before installation.
4. Weight Capacity: 440 lbs.
5. Color: Graphite Gray.

6. Warranty: Three year limited warranty on parts; one year on labor.
7. Product:
    a. Basis of Design: MAX-Ability, Inc., Pressalit Care 3000, model R8435318301, fixed height adult changing table, www.max-ability.com.

B. Adjustable Height Wall Mounted Fold Down Changing Station, (**T28**):
1. Length: 75.25"
2. Width: 31"
3. Height: Adjustable from 12" to 38 7/8"
4. Electrical:
    a. Operate at 24v / 1amp via 120v wall outlet
    b. Integrated transformer and US 8’ power cord
    c. Linak liquid tight actuator and control system
    d. Chain drive; maintenance free motor
5. Weight Capacity: 440 lbs.
6. Color: Graphite Gray.
7. Warranty: Three year limited warranty on parts; one year on labor.
8. Product:
    a. Basis of Design: MAX-Ability, Inc., Pressalit Care 3000, model R8592318301, electrically height adjustable adult changing table, www.max-ability.com.

2.09 UTILITY ROOM ACCESSORIES

A. Mop and Broom Holder, (**T24)**: 0.05 inch thick stainless steel, Type 304, hat-shaped channel.
1. Holders: Three spring-loaded rubber cam holders.
2. Length: Manufacturer's standard length for number of holders.
3. Mounting: Surface.
4. Products:
    a. Basis of Design: Model 9953 as manufactured by Bradley Corporation.

B. Mop Basin Hose and Bracket, (**T24A**): Heavy-duty 5/8-inch, cloth-reinforced flexible rubber hose with 3/4-inch brass coupling. Stainless steel, Type 304, bracket with rubber grip.
1. Length: 30 inches.
2. Mounting: Surface.
3. Products:
    a. Basis of Design: Zurn Light Commercial Plumbing Products; Zurn Z1996-HH: www.zurn.com.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. Verify that field measurements are as indicated on drawings.

D. See Section 06 1000-Rough Carpentry for installation of blocking, reinforcing plates, and concealed anchors in walls and ceilings.

3.02 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

D. Locate accessories in order that they do not interfere with door swings or use of fixtures. Install recessed accessories after wall finishes have been completed.

E. Anchor accessories with bolts, plates, and approved type fasteners. Take down any loose items and repair damaged wall surfaces. Accessories anchored to toilet partitions shall be thru-bolted.

F. Mount surface mounted accessories to backup material with toggle bolts, plumb and align.

G. At metal stud partitions, provide fire-retardant treated wood blocking for anchorage of grab bars, wall-mounted seats and benches, baby changing stations, and other such wall-mounted accessories where additional loads are anticipated.
   1. For accessories protruding 3-inches or less from the wall, Contractor may utilitize ClarkDietrich Danback Flexible Wood Backing System with FlamePRO fire-retardant treated wood.

H. At recessed electric hand dryers located in metal stud wall partitions, install rigid sound insulation in wall around unit.

3.04 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

3.05 SCHEDULE

A. Provide the following accessories at type of room scheduled, whether indicated on the drawings or not. Refer to drawings for configuration and mounting heights. Provide (1) of each per accessory listed unless otherwise noted or designated as Owner-furnished.

B. Type C – Toilet Compartments
   1. Type C1 Standard Compartment:
      a. T1 Toilet Tissue (Roll) Dispenser.
      b. T2 Sanitary Napkin Disposal (at designated female restrooms, grades 6 to adult only).
   2. Type C2, C3 and C5 Accessible Compartments:
      a. T1 Toilet Tissue (Roll) Dispenser
      b. T2 Sanitary Napkin Disposal (at designated female restrooms, grades 6 to adult only).
      c. T4 Grab Bars, 36 inch.
      d. T5 Grab Bars, 42 inch.
   3. Type C4 Ambulatory Accessible Compartment:
      a. T1 Toilet Tissue (Roll) Dispenser.
      b. T2 Sanitary Napkin Disposal (at designated female restrooms, grades 6 to adult only).
      c. T5 Grab Bars, 42 inch; (2) each.

C. Type L - Lavatories:
   1. T9 Mirror.
   2. T11 Soap Dispenser. At locations with multiple lavatories, provide at a ratio of (1) dispenser per (2) lavatories.
   3. T23 Undersink Piping Covers per lavatory.

D. Type MS - Mop Sink Locations:
   1. T24 Mop and Broom Holder.
   2. T24A Mop Basin Hose and Bracket.

E. Type S – Showers:
   1. Type S1 Transfer Type Shower Compartment:
      a. T13 Coat/Clothes Hook. Locate adjacent to shower seat wall.

b. T15 Shower Grab Bar.
c. T17 Shower Curtain & Rod w/Curtain Hooks.
d. T18 Folding Shower Seat.
e. T22 Wall-Mounted Soap Dish.

2. Type S2 Standard Roll-In Type Shower Compartment:
   a. T13 Coat/Clothes Hook. Locate at nearest adjacent wall to shower.
   b. T14 Shower Grab Bar, 24 inch, (2) each.
   c. T16 Shower Grab Bar, 48 inch.
   d. T17 Shower Curtain & Rod w/Curtain Hooks.
   e. T22 Wall-Mounted Soap Dish.
3. Type S3 Standard Roll-In Type Shower Compartment w/Seat:
   a. T13 Coat/Clothes Hook. Locate adjacent to shower seat wall.
   b. T15A Shower Grab Bar.
   c. T17 Shower Curtain & Rod w/Curtain Hooks.
   d. T18 Folding Shower Seat.
   e. T22 Wall-Mounted Soap Dish.
4. Type S4 Shower Compartment (Non-Accessible):
   a. T13 Coat/Clothes Hook. Locate at nearest adjacent wall to shower.
   b. T17 Shower Curtain & Rod w/Curtain Hooks.
   c. T22 Wall-Mounted Soap Dish.
5. Multi-User Showers:
   a. T19 Towel Bar. Locate at nearest adjacent wall to shower; (2) each.

F. Type T – Toilet Rooms:
1. Type T1 Single-User Toilet Room:
   a. T1 Toilet Tissue (Roll) Dispenser.
   b. T2 Sanitary Napkin Disposal (at unisex or designated female restrooms, grades 6 to adult only).
   c. T4 Grab Bars, 36 inch.
   d. T5 Grab Bars, 42 inch.
   e. T6 Paper Towel (Roll) Dispenser.
   f. T9 Mirror.
   g. T11 Soap Dispenser.
   h. T13 Coat/Clothes Hook.
   i. T23 Undersink Piping Covers.
2. Type T2 Single-User or Family Toilet Room:
   a. T1 Toilet Tissue (Roll) Dispenser.
   b. T2 Sanitary Napkin Disposal (at unisex or designated female restrooms, grades 6 to adult only).
   c. T4 Grab Bars, 36 inch.
   d. T5 Grab Bars, 42 inch.
   e. T6 Paper Towel (Roll) Dispenser.
   f. T9 Mirror.
   g. T11 Soap Dispenser.
   h. T20 Baby Changing Station.
   i. T13 Coat/Clothes Hook.
   j. T23 Undersink Piping Covers.

G. Type WF - Wash Fountains
1. T9 Mirror, one per station.
2. T11 Soap Dispenser, (2) each.
3. T23 Undersink Piping Covers, if wash fountain is not provided with skirt.

H. Break Rooms, Work Rooms, Clinics, Classrooms:
   1. T6 Paper Towel (Roll) Dispenser.
      a. At each sink location
   2. T11 Soap Dispenser.
      a. At each sink location

END OF SECTION

SECTION 10 4313
DEFIBRILLATOR CABINETS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Defibrillator Cabinets

1.02 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product data: Within 30 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
   1. Materials list of items proposed to be provided under this Section;
   2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
   3. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.03 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. The contractor shall furnish a written guarantee warranting all materials, devices, equipment and workmanship to be free of defects for a period of one (1) year from the date of completion and acceptance. Any defects in materials, devices, equipment and workmanship which become apparent within the guarantee period shall be repaired and replaced by the contractor at his own expense and at no additional cost to the Owner.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. JL Industries/Activar: www.activarcpg.com

B. Substitutions: See Section 01 6000 - Product Requirements.

2.02 DEFIBRILLATOR CABINETS:

A. Basis of Design: 1400 Lifestart Series AED Cabinets
   1. Cabinet with Steel Trim and Door: 1400 Lifestart Series, model 1417
      a. Cabinet Style: Semi-recessed.
      b. Components:
         1) Tub: Cold-rolled steel.
            (a) Finish: Factory-applied white powder coat paint finish.
         2) Door and Trim Construction: Cold-rolled steel; flush doors with 5/8 inch (15.88 mm) door stop attached by continuous hinge and equipped with zinc-plated with roller catch.
            (a) Finish: Factory-applied white powder coat paint finish.
            (b) Style F17: Full Tempered Glazing; Pull & AED Decal
         3) Trim Style and Depth:
            (a) Semi-Recessed Cabinet:
            (b) Square Edge: 1-1/2 inch (38.10 mm).
      c. Fire-Rating: Nonfire-rated or Fire-Rated, reference plan for requirements.
      d. Alarms: Standard: 85 db Commander (audible) cabinet-mounted alarm standard (battery operated) to protect against theft or tampering. Alarm deactivated when door is closed.
      e. Wall Signs and Cabinet Lettering:
         1) AED wall signs: 14S

PART 3 – EXECUTION

3.01 INSTALLATION

A. Install in accordance with approved submittals and manufacturer's instructions.

B. This contractor shall do all fitting, fastening, connecting, leveling and placing of all Equipment as required to complete each item in its permanent position.

3.02 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. Demonstrate proper operation of equipment to Owner's designated representative.

3.03 ADJUSTING

A. Prepare equipment and systems in accordance with manufacturers' instructions and recommendations.

B. Field Test after completing installation to verify performance.

C. Adjust for proper operation within manufacturer's published tolerances.

END OF SECTION

SECTION 10 4400
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguisher cabinets.

B. Accessories.

C. Fireman's Knox Items: Box, Padlock, and FDC Plug.

1.02 RELATED REQUIREMENTS

A. Section 01 4100 - Regulatory Requirements

B. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.

1.03 DEFINITIONS

A. Where indicated on the Drawings, the abbreviation "F.E.C." defines a fire extinguisher and cabinet and the abbreviation "F.E." is for a fire extinguisher without a cabinet.

1.04 REFERENCE STANDARDS

A. FM (AG) - FM Approval Guide; current edition.

B. NFPA 10 - Standard for Portable Fire Extinguishers; 2026.

C. UL (DIR) - Online Certifications Directory; Current Edition.

D. International Fire Code.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide extinguisher operational features, color and finish, and anchorage details.

C. Shop Drawings: Indicate locations of cabinets, cabinet physical dimensions, rough-in measurements for recessed cabinets, locations of individual fire extinquishers, mounting measurements for wall bracket, installation procedures, and accessories required for complete installation.

D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

G. Material and Safety Data Sheets for all mastics, glues, and adhesives and for insulating material for fire doors.

1.06 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain products in this Section from one manufacturer.

B. Certifications

1. Provide extinguishers which are U.L. listed and bear the U.L. "Listing Work" for type, rating, and classification.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Section 01 6000 - Product Requirements.

B. Store extinguishers in protected location until after final cleaning is completed.

1.08 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

1.09 WARRANTY

A. Comply with requirements of Section 01 7800 - Closeout Submittals.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguishers and Cabinets and Accessories:
   1. JL Industries, Inc: www.jlindustries.com.
   2. Kidde, a unit of United Technologies Corp: www.kidde.com.
   3. Larsen's Manufacturing Co: www.larsensmfg.com.
   4. Nystrom, Inc: www.nystrom.com/sle.
   5. Potter-Roemer: www.potterroemer.com.
   6. Samson Products, Inc.: www.samsonproducts.com.
   7. Strike First Corporation of America: www.strikefirstusa.com.
   8. Substitutions: See Section 01 6000 - Product Requirements.

B. Fireman’s Knox Box:
   1. Knox Company; www.knoxbox.com.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
   1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.
   2. UL Rating: 2A-10B:C, minimum.

B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
   1. Product: MP10 for all typical installations.
   2. Product: MP5 at Elevator Equipment Rooms and Science Labs.
   3. Class: A:B:C type.
   4. Size: 5 and 10 pound.

C. Halotron I Type Fire Extinguishers: Stainless steel tank, with pressure gage.
   1. Product: HT5 at Computer Lab.
   2. Class: A:B:C type.
   3. Size: 5 pound.

D. Wet Chemical Type Fire Extinguishers: Stainless steel tank, with pressure gage.
   1. Product: WC-6L (6 liter capacity) at Kitchen (20 ft. away from hood).
   2. Class: K.
   3. Size: 1.6 gallons.

2.03 FIRE EXTINGUISHER CABINETS

A. Product - reference schedule below: Model numbers are based on Larsen's Manufacturing Co.

Wall Construction	Model	Fire Rated	Projection	Box Depth	Wall Depth
3-5/8" Metal Stud or 6" CMU	AL-2409-6R	No	2-1/2"	6"	4"
3-5/8" Metal Stud or 6" CMU	AL-FS-2409-R4	Yes	3-1/2"	6"	4"

8" CMU or wider	AL-2409-6R	No	2-1/2"	6"	4"
8" CMU or wider	AL-FS-2409-6R	Yes	2-1/2"	6"	4-7/8"
8" CMU	AL-2712-RA	No	4"	8"	4-1/2"
8" CMU	AL-FS-2712-RA	Yes	4"	8"	5-3/8"

B. Cabinet Configuration: Semi-recessed type.
   1. Projected Trim: Returned to wall surface, with 2-1/2 inch projection, and 1 inch wide face.

C. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with roller type catch. Hinge doors for 180 degree opening with continuous piano hinge. Provide solid doors at athletic and shop areas.

D. Door Glazing: Tempered glass, clear, 1/8 inch thick, and set in resilient channel glazing gasket.

E. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.

F. Weld, fill, and grind components smooth.

G. Finish of Cabinet Exterior Trim and Door: Clear satin anodized aluminum.

H. Finish of Cabinet Interior: White colored enamel.

2.04 ACCESSORIES

A. Extinguisher Brackets: Formed steel, chrome-plated.

B. If extinguisher is not located in a cabinet, provide bracket no. 860.

C. Graphic Identification: Applied decal use vertical decal spelling.

2.05 FIREMAN'S KNOX BOX

A. Provide and install emergency access lock box where shown on the drawings.
   1. Mount: Recessed (7"x7"x3.25"), provide recessed mounting kit with face flange. Mount at 6'-0" above ground level, verify with fire marshal.
   2. Lock: U.L. Listed. Double action rotating tumblers and hardened steel pins accessed by a biased cut key.
   3. Finish: Pre-treatment – Zinc Phosphate; Final Coating – weather resistant polyester powdercoat.
      a. Color: Black.
   4. Alarm: Alarm tamper switch. Connect to buildings security system.
   5. Model: "Knoxbox Series 3200".

B. Provide and install two-position electric override key switch with mounting plate. Provide lock cover with weather resistant operation and an emergency agency ID label. Controls emergency power system shutoff. Refer to electrical drawings for locations.
   1. Mount: Recessed, provide recessed mounting kit with face flange. Mount as directed by fire marshal.
   2. Alarm: Alarm tamper switch. Connect to buildings security system.
   3. Model: "Knoxbox 4505 with key switch".

2.06 FIREMAN'S KNOX PADLOCK

A. Provide padlock at access gates where indicated on plan.
   1. 3/8" diameter stainless steel shackle.
   2. Heavy-duty brass body with EPDM boot.
   3. Model: Knox 3753.

2.07 FIREMAN'S KNOX FDC PLUG

A. Provide FDC plugs at all locations.
   1. Plug shall be locking style with Knox key wrench.

2. Bright stainless cover.
3. Verify plug size and threads with Fire Department.
4. Model: Knox Model 3011.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level in wall openings at locations shown on the Drawings. Install compliant with applicable accessibility requirements.

C. Secure rigidly in place.

D. Place extinguishers and accessories in cabinets.

END OF SECTION

SECTION 10 5100
LOCKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal lockers.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete base construction.

B. Section 06 1000 - Rough Carpentry: Wood blocking and nailers.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's published data on locker construction, sizes and accessories.

C. Shop Drawings: Indicate locker plan layout, numbering plan.

D. Samples: Submit two samples 12 by 12 inches in size, of each color scheduled.

E. Manufacturer's Installation Instructions: Indicate component installation assembly.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Section 01 6000 - Product Requirements.

B. Protect locker finish and adjacent surfaces from damage.

1.05 WARRANTY

A. See Section 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide one year manufacturer warranty for repair or replacment of lockers that fail in material or workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Lockers:
   1. ASI Storage Solutions, Inc.: www.asilockers.com.
   2. Debourgh Manufacturing Co.: www.debourgh.com.
   3. List Industries: www.listindustries.com.
   4. Lyon Workspace Products: www.lyonworkspace.com.
   5. Penco Products, Inc: www.pencoproducts.com.
   6. Republic Storage Systems Co: www.republicstorage.com.
   7. WEC Manufacturing: www.itswec.com
   8. Win-Holt Equipment: www.winholt.com.
   9. Substitutions: See Section 01 6000 - Product Requirements.

2.02 LOCKER APPLICATIONS

A. Size, type and quantity: Reference Drawings.
   1. Basis of Design:
      a. Typical Lockers: Republic Storage Systems, Single Point II Corridor.

2.03 METAL LOCKERS

A. All Lockers: Factory assembled, made of formed sheet steel, Cold-rolled mild steel, uncoated, stretcher leveled; metal edges finished smooth without burrs; baked enamel finished inside and out.
   1. Where ends or sides are exposed, provide flush panel closures.
   2. Provide filler strips where indicated, securely attached to lockers.

3. Colors: Refer to Schedule of Materials and Colors.

B. Assembly:
   1. Typical Lockers: (KD) Rivet with backup washer to provide permanent shake-proof fastening.

C. Typical Locker Body: Formed and flanged; with steel stiffener ribs.
   1. Body, Shelves, Tops and Trim: 24 gage, 0.0239 inch.
   2. Base: Reference drawings for base height and details

D. Frames: Formed channel shape, welded and ground flush, welded to body, resilient gaskets and latching for quiet operation.
   1. Door Frame: 16 gage, 0.0598 inch, minimum.
   2. Provide ventilation slots in top and bottom of door frame.

E. Doors: Hollow channel edge construction, 1 inch thick; welded construction, channel reinforced top and bottom with intermediate stiffener ribs, grind and finish edges smooth.
   1. Door Outer Face: 14 gage, 0.0747 inch, minimum.
   2. Form recess for operating handle and locking device.
   3. Ventilation Method for Typical Lockers: Provide ventilation slots in top and bottom of door.

F. Hinges: Two for doors under 42 inches high; three for doors over 42 inches high; 2" high, 5-knuckle, full loop, tight pin style, weld securely to locker body and double riveted to the inside of the door.
   1. Hinge Thickness: 14 gage, 0.0747 inch.

G. Coat Hooks: Stainless steel or zinc-plated steel.
   1. Two single prong wall hooks and one double prong back hook for all single, double, and triple tier lockers. For lockers over 42" high, provide one hat shelf. Lockers under 20" high are not equipped with hooks.

H. Number Plates: Provide rectangular shaped aluminum plates. Form numbers 1/2 inch high of block font style, in contrasting color.

I. Latching: Latching shall be achieved by securing a frame hook to the locker side frame located midway up on the door.
   1. Locking device is loose padlock provided by Owner. The frame hook shall have a padlock hasp protruding through the stainless steel recessed pocket. Hasp shall be welded to channel frame member. Riveted hasps are not acceptable.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared bases are in correct position and configuration.

B. Verify bases and embedded anchors are properly sized.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install lockers plumb and square.

C. Place and secure on prepared base.

D. Secure lockers with anchor devices to suit substrate materials. Minimum Pullout Force: 100 lb.

E. Bolt adjoining locker units together to provide rigid installation.

F. Install end panels, filler panels, and sloped tops.

G. Install accessories.

H. Conceal fasteners on all face frames.

I. Replace components that do not operate smoothly.

3.03 CLEANING

A. Clean locker interiors and exterior surfaces.

END OF SECTION

SECTION 10 5613
METAL STORAGE SHELVING

PART 1 – GENERAL

1.01 DESCRIPTION

A. Work included: Provide metal storage shelving where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these specifications.

1.02 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.03 SUBMITTALS

A. Comply with pertinent provisions of Section 01 3000 - Administrative Requirements.

B. Product Data: Within 15 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
   1. Materials list of items proposed to be provided under this Section;
   2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
   3. Shop Drawings in sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with the work of adjacent trades.
   4. Samples of the proposed products, showing profiles joining, finish, and manufacturers full range of color.
   5. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.04 PRODUCT HANDLING

A. Comply with pertinent provisions of Section 01 6000 - Product Requirements.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements, manufacturer offering products that may be able to be included in the work include, but are not limited to the following:
   1. Penco Products, Inc., 800-562-1000 www.pencoproducts.com.

2.02 MATERIALS

A. Cold Rolled Steel Sheet: ASTM A336/A 366M, matte finish, suitable for exposed applications, and stretcher leveled or roller leveled to stretcher level flatness.

B. Galvanized Steel Sheet: ASTM A 653/A 653M, commercial quality, G60 (Z180) coating designation; mill phosphatized; suitable for exposed applications, and stretcher leveled or roller leveled to stretcher level flatness.

2.03 COMPONENTS - BOLTLESS SHELVING

A. Boltless Shelving consists of simple components that lock rigidly together to form exceptionally strong shelving units. Equal to single rivet high density units as manufactured by Penco.

B. Choose from a wide selection of component sizes and capacities to fit the storage requirements.

C. ANGLE POST - 1-7/8" x 1-7/8": When maximum capacity and stability are essential, the heavy duty angle post is the proper choice. Ideally suited for two level shelving, storage deck and high rise shelving applications.

D. TEE POST - 3-3/4" x 1-7/8" (Heavy Duty): Used in the same way as the standard tee, when increased load capacities are required.

E. SINGLE RIVET SHELF BEAM (Heavy Duty): Manufactured to provide maximum capacity with very little loss of usable vertical space between shelves.

F. DOUBLE RIVET ANGLE BEAM (Heavy Duty): Provides stability and increased load capacity in the longer lengths.

G. DOUBLE RIVET CHANNEL BEAM: Designed to provide maximum left to right stability and higher capacity heavy duty beams.

H. CENTER SUPPORT: Used with double rivet beams to provide front-to-rear support for shelf deck and provides added stability to beams.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Install shelving level, plumb, rigid, and flush according to the manufacturer's written instructions.

B. Connect groups of shelves together with standard fasteners

C. Anchor shelves and walls at intervals recommended by the manufacturer, but not more than 36 inches o.c.

D. Touch up marred finish, or replace units that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by the locker manufacturer.

END OF SECTION

SECTION 10 7113.43
FIXED SUN SCREENS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Modular, shop fabricated, extruded aluminum sun screens to be mounted on structure provided by others.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Mounting substrates.

B. Section 04 2000 - Unit Masonry: Mounting substrates.

C. Section 05 1200 - Structural Steel Framing: Mounting substrates.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).

B. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014 (Editorial 2017).

C. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2021a.

D. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

E. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

F. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

G. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

H. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs; 2017.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Prior to commencement of fabrication, submit detailed shop drawings, showing all profiles, sections of all components, finishes, fastening details, and manufacturer's technical and descriptive data. Include field dimensions of openings and elevations on shop drawings.

C. Design Data: Submit comprehensive structural analysis of design for the specified loads. Stamp and sign calculations by professional engineer.

D. Shop drawing sheets that include engineering information designed by the Contractor’s Delegated Design Engineer shall be signed and sealed in accordance with the Texas Engineering Practice Act. Sheets that do not provide information designed by the Contractor’s Engineer do not require being signed and sealed. Calculation packages require a signed and sealed cover sheet only. Any submittals requiring to be signed and sealed that are received without the signature and seal will be rejected without review.

E. Samples: 12 inches by 12 inches minimum illustrating design, workmanship and finish color.

F. Sample of Louver: For review of shape only.

G. Designer's Qualification Statement.

H. Specimen Warranty: Furnish a copy of manufacturer's standard warranty.

1.05 QUALITY ASSURANCE

A. Designer Qualifications: Perform structural design under direct supervision of a Professional Engineer experienced in design of this type of work licensed in Texas.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with no less than five years of documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section.
   1. With minimum five years of documented experience.
   2. Approved by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site ready for erection.

B. Package using methods that prevent damage during shipping and storage on site.

C. Store materials under cover and elevated above grade.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Sun Screens: Correct defective work within a one year period after Date of Substantial Completion.

C. Finish Warranty: Provide manufacturer's ten year warranty on factory finish against cracking, peeling, and blistering for painted finishes and two years for anodized finishes.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fixed Sun Screens:
   1. Architectural Fabrication, Inc.: www.arch-fab.com
   2. AVAdek: www.avadek.com.
   3. Aluminum Techniques Inc.: www.aluminumtechniques.com
   4. Canopy Solutions, LLC: www.canopy-solutions.com
   5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 SUN SCREENS

A. Sun Screens: Shop fabricated, shop finished, extruded aluminum outriggers, louvers, and fascia, free of defects impairing strength, durability or appearance.
   1. Configuration: As indicated on drawings.
   2. Louver Type: Circular face with Slat blades.
   3. Sun Screen Angle: Confirm blade orientation with Architect prior to ordering.
   4. Outrigger Shape: Bullnose. Confirm configuration with Architect prior to ordering.
   5. Design Criteria: Design and fabricate to resist required loads without failure, damage, or permanent deflection.
   6. Exposed Aluminum Finish: Class I natural anodized.
   7. Provide a complete system ready for erection at project site.
   8. Shop fabricate to the greatest extent possible; disassemble if necessary for shipping.

2.03 MATERIALS

A. Aluminum Extrusions: ASTM B209 (ASTM B209M) or ASTM B221 (ASTM B221M).

B. Aluminum Coated Steel Sheet: ASTM A792/A792M.

C. Concealed Structural Supports: Aluminum, or steel coated for corrosion resistance and dissimilar metal isolation.

D. Fasteners: ASTM F593 stainless steel or ASTM A307 carbon steel.

2.04 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates and site area for conditions that might prevent satisfactory installation.

B. Verify that dimensions of supporting structure are within plus/minus 1/8 inch of dimensions indicated on shop drawings.

C. Verify that all adjacent painting, roofing, masonry work, and other work that might damage sun screen finish has been completed prior to installation of sun screens.

D. Do not install until after all adjacent painting, roofing and masonry have been completed.

E. Do not proceed with installation until all conditions are satisfactory.

3.02 INSTALLATION

A. Install in accordance with manufacturer's installation instructions.

B. Set units level, plumb, with uniform joints, and aligned with building elements.

C. Separate dissimilar metals using concealed bituminous paint or non-absorbent gasket.

D. Anchor units to structure as indicated on drawings.

E. Do not cut or trim aluminum members without approval of manufacturer; do not install damaged members.

F. Touch-up damaged finish coating using material provided by manufacturer to match original coating.

3.03 TOLERANCES

A. Maximum Variation from Level: Plus/Minus 1/8 inch.

3.04 CLEANING

A. Clean exterior surfaces units of dust and debris; follow manufacturer's cleaning instructions for the finish used.

3.05 PROTECTION

A. Protect units after installation to prevent damage due to other work until Date of Substantial Completion.

END OF SECTION

SECTION 10 7300
PROTECTIVE COVERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pre-engineered, free-standing, pre-finished extruded aluminum walkway covers.

B. Pre-engineered, pre-finished extruded aluminum wall mounted hanging canopies.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete

1.03 REFERENCE STANDARDS

A. AA ADM – Aluminum Design Manual; As Referenced in the International Building Code.

B. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2012.

C. AAMA 612 - Voluntary Specification, Performance Requirements and Test Procedures for Combined Coatings of Anodic Oxide and Transparent Organic Coatings on Architectural Aluminum; 2002.

D. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performance Organic Coatings on Aluminum Extrusions and Panels - American Architectural Manufacturers Association; 2011

E. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 6000 Tensile Strength; 2010.

F. ASTM A792/A792M - Steel Sheet, 55% Aluminum-Zinc Alloy Coated by Hot Dip Process; 2010.

G. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2010.

H. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2012.

I. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws and Studs; 2002 (Reapproved 2008).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Prior to commencement of fabrication, submit detailed shop drawings, showing all profiles, sections of all components, finishes, fastening details, and manufacturer's technical and descriptive data. Include field dimensions of openings and elevations on shop drawings.

C. Design Data: Submit comprehensive structural analysis of design for the specified loads. Stamp and sign calculations by profession engineer.

D. Shop drawing sheets that include engineering information designed by the Contractor’s Delegated Design Engineer shall be signed and sealed in accordance with the Texas Engineering Practice Act. Sheets that do not provide information designed by the Contractor’s Engineer do not require being signed and sealed. Calculation packages require a signed and sealed cover sheet only. Any submittals requiring to be signed and sealed that are received without the signature and seal will be rejected without review.

E. Samples: 12 inches by 12 inches minimum illustrating design, workmanship and finish color.

F. Designer Qualification Statement.

G. Specimen Warranty: Furnish a copy of manufacturer's standard warranty.

H. Installer Qualification Statement.

1.05 QUALITY ASSURANCE

A. Designer Qualifications: Perform design under direct supervision of a Professional Engineer experienced in design of this type of work licensed in Texas.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with no less than five years of documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section, and;
   1. With minimum five years of documented experience.
   2. Approved by manufacturer.

D. Coordination: Coordinate work of this section with work of other sections which interface with covered walkway or canopy system (sidewalks, curbs, building fascias, etc.).

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site ready for erection.

B. Package using methods that prevent damage during shipping and storage on site.

C. Store materials under cover and elevated above grade.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a one-year period after date of Substantial Completion.

C. Finish Warranty: Provide manufacturer's ten year warranty on factory finish against cracking, peeling, and blistering and two years for anodized finishes.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Protective Covers:
   1. AVAdek: www.avadek.com.
   2. Architectural Fabrication, Inc.: www.arch-fab.com.
   3. Aluminum Techniques Inc.: www.aluminumtechniques.com.
   4. Canopy Solutions, LLC: www.canopy-solutions.com.
   5. DITT-Deck, Dittmer: www.dittdeck.com.
   6. Peachtree Protective Covers: www.peachtreecovers.com.
   7. East Texas Canopy, Inc: www.easttexascanopy.com.
   8. Substitutions: See Section 01 6000 - Product Requirements.

2.02 WALKWAY COVERS

A. Extruded Aluminum Walkway Cover shall consist entirely of extruded aluminum sections(roll-formed not acceptable). System shall consist of heli-arc welded, one-piece rigid structural bents (column and beam assemblies), decking, fascia, accessory items and hardware to provide a complete system.
   1. Configuration: As indicated on drawings.
   2. Sizes: As indicated on drawings.
   3. Design Criteria: Design and fabricate to resist loads without failure, damage, or permanent deflection as dictated by the applicable building code. Structure shall be capable of sustaining and supporting a concentrated load such as being walked upon.
      a. For welded material, the tensile ultimate strength, “Ftuw”, and tensile yield strength, “Ftyw”, shall be used to determine available strength within weld-affected zone.
      b. Design, fabrication, and erection of aluminum load-carrying structures, members, and connections shall be in accordance with AA ADM - Aluminum Design Manual; As Referenced in the International Building Code.
   4. Finish: Natural anodized, Class I AAMA 611 AA-M12C22A41 or AAMA 612 with electrolytically deposited organic seal; not less than 0.7 mils thick.

5. Provide a complete system ready for erection at project site.
6. Shop-fabricate to the greatest extent possible; disassemble if necessary for shipping.
7. The Contractor's Walkway Cover Engineer shall not bear on the existing building unless the Walkway Cover Engineer or another Structural Engineer hired by the Contractor evaluates the capacity of the existing structure to withstand loads that would be imposed by the walkway cover and either verifies that there is sufficient capacity or modifies the existing structure in a way that is approved by the Architect. If the covering is connected to the existing building, the Walkway Cover Engineer shall design the connection. For proposal purposes, the Contractor shall assume that it is not acceptable to bear on or attach to the existing building other than with flashing. The Contractor shall be permitted to submit alternative layouts of columns for consideration by the Architect if the alternative layout does not increase the cost of construction or the schedule.

B. Concrete Foundations
   1. Where foundation design and detailing is not included in the Architectural or Structural Drawings, the foundation shall be designed by the Contractor's Walkway Cover Engineer in accordance with the following:
      a. All foundations designed by the Walkway Cover Engineer shall be required to comply with the recommendations of the Geotechnical Engineer in the soil reports provided as part of this project manual.
      b. If the Geotechnical Engineering report provided is not applicable to this project, the Contractor's Walkway Cover Engineer shall design the foundation to be consistent with the minimum requirements of the locally adopted version of the International Building Code. If the minimum requirements of the locally adopted version of the International Building Code require that a soil investigation be performed, the Contractor shall hire the Owner's Geotechnical Engineer at no additional cost to the Owner (including the cost for this work in the Contractor's proposal for the main contract to do this project) and it shall not be permitted to increase the construction schedule beyond the agreed upon schedule to perform the project which is to include the time it takes to have the soil report performed if necessary.
   2. The Contractor shall have foundations designed and installed to accommodate existing conditions such as nearby existing foundations (which shall not be undermined) and overhead obstructions (which may require low-overhead pier drilling equipment).
   3. Refer to Section 03 3000 - Cast-In-Place Concrete.
   4. Sleeves (styrofoam blockout) shall be furnished by the walkway cover manufacturer and placed by the general contractor.

2.03 CANOPY SYSTEMS

A. The Contractor's Canopy Engineer shall design the attachment of the canopies to the Structure. Where allowable reactions are provided on the Structural Drawings, the Contractor's Canopy Engineer shall design their attachments to not exceed these allowable reactions. Where no allowable reaction is provided, the Contractor's Canopy Engineer shall evaluate the Structure provided and limit reactions so as to not exceed its structural capacity or modify the existing structure in a way that is approved by the Architect. The Contractor shall be permitted to submit alternative configurations for consideration by the Architect if the alternative configurations do not increase the cost of construction or the schedule.

B. Canopy: Shop fabricated, shop finished, extruded aluminum decking, (roll-formed not acceptable), outriggers, fascia and hanging rod assemblies free of defects impairing strength, durability or appearance.
   1. Configuration: As indicated on drawings.
   2. Sizes: As indicated on drawings.
   3. Design Criteria: Design and fabricate to resist loads without failure, damage, or permanent deflection as dictated by the applicable building code. Structure shall be capable of sustaining and supporting a concentrated load such as being walked upon.

a. For welded material, the tensile ultimate strength, “Ftuw”, and tensile yield strength, “Ftyw”, shall be used to determine available strength within weld-affected zone.
b. Design, fabrication, and erection of aluminum load-carrying structures, members, and connections shall be in accordance with AA ADM - Aluminum Design Manual; As Referenced in the International Building Code.

4. Finish: Natural anodized, Class I AAMA 611 AA-M12C22A41 or AAMA 612 with electrolytically deposited organic seal; not less than 0.7 mils thick.
5. Provide a complete system ready for erection at project site.
6. Shop-fabricate to the greatest extent possible; disassemble if necessary for shipping.

2.04 MATERIALS

A. Aluminum Extrusions: ASTM B209 or B 221.

B. Aluminum Coated Steel Sheet: ASTM A792/A792M.

C. Concealed Structural Supports: Aluminum, or steel coated for corrosion resistance and dissimilar metal isolation.

D. Fasteners: ASTM F593 stainless steel or ASTM A 307 carbon steel.
1. 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.
2. Fascia Rivets: Size 3/16" by 1/2" grip range aluminum rivets with aluminum mandrel.
3. Bolts: All bolts, nuts and washers to be 18-8 non-magnetic stainless steel.
4. Tek Screws: not permitted

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates and site area for conditions that might prevent satisfactory installation.

B. Verify that dimensions of supporting structure are within plus/minus 1/8 inch of dimensions shown on shop drawings.

C. Verify that all adjacent painting, roofing, masonry work, and other work that might damage finish has been completed prior to installation of sun shades.

D. Do not install until after all adjacent painting, roofing and masonry have been completed.

E. Do not proceed with installation until all conditions are satisfactory.

3.02 INSTALLATION

A. Install in accordance with manufacturer's installation instructions.

B. Set units level, plumb, with uniform joints, and aligned with building elements.

C. Separate dissimilar metals using concealed bituminous paint or non-absorbent gasket.

D. Anchor units to structure as indicated on the drawings.

E. Do not cut or trim aluminum members without approval of manufacturer; do not install damaged members.

F. Touch-up damaged finish coating using material provided by manufacturer to match original coating.

3.03 TOLERANCES

A. Maximum Variation from Level/Plumb: Plus/Minus 1/8 inch.

3.04 CLEANING

A. Clean exterior surfaces units of dust and debris; follow manufacturer's cleaning instructions for the finish used.

3.05 PROTECTION

A. Protect units after installation to prevent damage due to other work until the Date of Substantial Completion.

END OF SECTION

SECTION 10 7340
FABRIC SHADE CANOPIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Canopy Foundations

B. Steel framing and fittings.

C. Covering material.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete

1.03 REFERENCE STANDARDS

A. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

B. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

C. AWI - AWS D1.1 - Structural Welding Code - Steel.

D. AISC - Specifications for the Design of Cold-Formed Steel Structural Members.

E. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

F. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.

G. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.

1.04 DESIGN REQUIREMENTS

A. Design structural components, develop shop drawings, and perform shop and site work under direct supervision of Professional Engineer experienced in design of this Work and licensed in the State of Texas.

B. Design members to withstand dead, live, wind & other applicable loads in accordance with ASCE-7 and applicable code.

C. Design foundations in accordance with ACI and applicable code and good construction practices for the specific structure and site conditions.

D. Cooperate with regulatory agency or authority and provide data as requested authority having jurisdiction.

E. Design structures for winds up to 170 mph winds with the cover off and 90 mph winds with the cover on and in accordance with the applicable code and meeting American Institute of Steel Construction (AISC) or American Iron and Steel Institute (AISI) specifications.

F. Design covers for easy removal and replacement.

G. Design covers for a maximum 5 lbs snow load.

H. Design covers for a maximum 10 lbs live load.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Shop Drawings: Shop Drawings: Indicate assembly dimensions, locations of structural members, connections, loads, and general construction details, anchorages and method of anchorage, method or installation; indicate welded connections with AWS A2.4 welding symbols; provide professional seal and signature.

D. Shop drawing sheets that include engineering information designed by the Contractor's Delegated Design Engineer shall be signed and sealed in accordance with the Texas Engineering Practice Act. Sheets that do not provide information designed by the Contractor's Engineer do not require being signed and sealed. Calculation packages require a signed and sealed cover sheet only. Any submittals requiring to be signed and sealed that are received without the signature and seal will be rejected without review.

E. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

F. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product and color.

G. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.06 QUALITY ASSURANCE

A. Conform to applicable code for fire resistance ratings for awning covering.

B. Manufacturer Qualifications: Manufacturer: Company specializing in manufacturing products specified in this section with minimum five years documented experience.

C. Installer Qualifications: Erector: Company specializing in performing Work of this section with minimum five years documented experience and approved by manufacturer.

D. Welder Qualifications: All welders must be AWS certified welders.

E. Coordination: Coordinate work of this section with work of other sections which interface with covered walkway or canopy system (sidewalks, curbs, building fascias, etc.).

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products with labels intact, in manufacturer's unopened packaging until ready for installation.

B. Handle materials so as to protect materials, coatings, and finishes during transportation and installation to prevent damage or staining. Handle fabric in accordance with manufacturer's instructions. Use care in handling of fabric to avoid damage to fabric material and coating. Do not damage, crush, or kink cables where occurs.

1.08 SEQUENCING

A. Ensure that locating templates and other information required for installation of products of this section are furnished to affected trades in time to prevent interruption of construction progress.

B. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.09 WARRANTY

A. Provide 20-year non-prorated warranty for all steel framework against all structural failure due to corrosion, deterioration, or workmanship.

B. Provide 12-year non-prorated warranty for all polyethylene covers against deterioration, rot, or faulty workmanship including seam failure.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fabric Shade Canopies:
   1. Apollo Sunguard Systems, Inc: www.apollosunguard.com
   2. Shade 'N Net: www.shade-n-net.com

3. USA Shade: www.usa-shade.com
4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 GENERAL REQUIREMENTS

A. Provide Pre Engineered shade structures to the overall sizes and configuration indicated on the Drawings.

B. Structural Design: Prepare complete structural design calculations for canopy members including footings.

C. Finish:
1. Refer to Section 01 6210 - Schedule of Materials and Colors for approved color selection for fabric and framing.
2. Post and Frame Finish: Galvanized and powder coated to a minimum of 4 mils.

2.03 FRAMING MATERIALS

A. Structural Steel Members: ASTM A36/A36M and be hot dip galvanized.

B. Structural Tubing: Allied Tube and Conduit tubing conforming to ASTM A500, Grade B, hot dip galvanized.

C. Plate or Bar Stock: ASTM A529/A529M and be hot dip galvanized.

D. Anchor Bolts: ASTM A307, galvanized.

E. Bolts, Nuts, and Washers: ASTM A325 or ASTM A490 and A315 stainless steel.

F. Welding Materials: AWS D1.1; type required for materials being welded.

G. Concrete anchor bolts shall conform to A307 and be Hot-dipped Galvanized or A316 Stainless Steel anchors as specified.

2.04 CABLE FASTENING AND TENSIONING MATERIALS

A. Cable and End Fittings: Design cables with a minimum safety factor of 2 on breaking strength.
1. Wire Rope shall conform to AISI Steel Cable Manual requirements with a Class A galvanized coating or approved substitute. Cable shall be IWRC improved plow steel.
2. Cable terminations and connectors shall be hot-dipped galvanized for corrosion protection.
3. Swaged and speltered fittings shall be designed and attached to develop the full breaking strength of the cable. Thimble end fittings shall develop a minimum of 110 percent of the cable breaking strength.
4. Swaged end fittings, pins, nuts and washers shall be electro-galvanized. Speltered end fittings shall be hot dipped galvanized.

2.05 COVERING MATERIALS

A. Shade Fabric:
1. High density polyethylene fabric with ultraviolet blocking additives.
2. Fabric shall be rachel knitted providing stability and fraying resistance when cut. Fabric shall be sewn with UV, Acid Rain and normal cleaning solution resistant thread.
3. Minimum Performance Properties:
   a. Burst Strength: 228 to 260 kpa.
   b. Fabric Mass: 200 to 195 gsm.
   c. Tear Strength:
      1) (warp) 83 kg (warp) 100 kg.
      2) (warp) 210 kg (warp) 182 kg.
4. Fire Rating:
   a. ASTM E 84: Class 1, Flame Spread 15, Smoke Developed 15.
   b. NFPA 701 Test Method 2 test standards: Pass.
5. Shade and UV Block: Minimum 80%

2.06 FABRICATION

A. Steel Components: Fabrication of steel components shall be in accordance with guidelines set forth in the AISC steel design manual and the AWS code of structural welding.
   1. All welds shall be in accordance with manufacturers design and performed prior to shipping. No welding shall be performed in the field.
   2. Structural members shall be fabricated in as large segments as possible to minimize field joints.
   3. Grind all corners and sharp edges.
   4. Steel will require abrasive blasting and primer before application of the polyester powder paint finish.
   5. Steel shall be polyester powder painted to a minimum thickness of 3 mils.
   6. Cables shall be tensioned to double the design load before length is cut.

B. Fabric Cover: Fabric cover fabricated with W. L. Gore Tenara UV resistant thread. Fabric connection points to be triple reinforced and heat sealed with vinyl interfacing inserted and sewn between layers of reinforcement. Fabric shall be prestressed prior to fabrication.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall substrate anchors are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply items required to be cast into concrete and embedded in masonry with setting templates, to appropriate Sections.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects.

C. Construct foundations in accordance with local codes and good construction practices for the specific structure and site conditions.
   1. Direct Embedment: Column shall be imbedded in a concrete footing in bare soil. Refer to Section 03 3000 Cast-i-Place Concrete for concrete requirements.
   2. Finish to be above grade and tapered to allow water runoff and prevent pooling.

D. Fabric: Prior to start of installation; check all surfaces of framing members and other rigid construction elements to be in contact with fabric to ensure that all edges are smooth and well rounded. Remove any potential causes for snagging or tearing of the fabric. Install all connections and provide all materials and equipment required for the erection and stressing of the fabric. Unroll the fabric in such a manner as to avoid snagging or dragging the fabric over sharp objects during installation. Appearance of the fabric membrane roof shall be smooth and wrinkle free. Creasing or folding the fabric around sharp corners shall be avoided at all times.

E. Fabric tensioning system: Cables shall be free of all kinks and bends. Care shall be taken not to damage the cables during installation. Bolt holes shall be 1/8 inch larger then the bolt, unless otherwise indicated.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Misalignment From True Position: 1/4 inch.

3.05 CLEANING AND ADJUSTING

A. Clean all surfaces and restore any marred or abraded surfaces to original conditions as approved by the Architect.

B. Adjust all cables and fabric as required to produce a smooth uniform appearance.

C. Clean canopies of dirt, dust and debris.

3.06 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 10 7500
FLAGPOLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum Flagpoles.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete base and foundation construction.

B. Section 09 9000 - Painting and Coating: Site painting.

1.03 REFERENCE STANDARDS

A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

B. ASTM B241/B241M - Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube; 2016.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on pole, accessories, and configurations.

C. Shop Drawings: Indicate detailed dimensions, base details, anchor requirements, and imposed loads.

D. Maintenance Data: Provide lubrication and periodic maintenance requirement schedules.

1.05 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. External Halyard System: Provide manufacturers standard halyard system, including:
   1. Provide flash collar of spun aluminum.
   2. Provide finial ball 6" in diameter of 14 gauge, spun aluminum on each flagpole.
   3. Provide truck assembly on each flagpole consisting of cast aluminum assembly with ball bearing non-fouling, revolving double truck.
   4. Provide cast aluminum cleats, 9" long, two per flagpole, with aluminum fastenings.
   5. Provide two continuous 3/8" diameter braided nylon halyards per flagpole, each with two bronze snaps with neoprene or vinyl covers.
   6. At each cleat, provide a cast aluminum cover with hasp for padlock, staple, and tamper-proof screws.
   7. Finish exposed surfaces to match the flagpoles.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Spiral wrap flagpole with protective covering and pack in protective shipping tubes or containers.

B. Protect flagpole and accessories from damage or moisture.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Flagpoles:
   1. Acme Flagpoles Company, Division of Lingo, Inc.: www.acmelingo.com.
   2. American Flagpole: www.americanflagpole.com.
   3. Babcock-Davis Associates, Inc.: www.babcock-davis.com.

4. Concord Industries, Inc: www.concordindustries.com.
5. Morgan-Frances Flagpoles: www.morgan-frances.com
6. Pole-Tech Co., Inc: www.poletech.com.
7. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FLAGPOLES

A. Flagpoles:
1. Material: Aluminum.
2. Design: Cone tapered.
3. Mounting: Ground mounted type.
4. Outside Butt Diameter: 6 inches.
5. Outside Tip Diameter: 3.5 inches.
6. Nominal Wall Thickness: .156 inches.
7. Nominal Height: 30 ft; measured from top of base. Where more than one pole is located in a group, all poles shall be 30 ft. high.
8. Halyard: External type.

B. Performance Requirements:
1. Structural Performance: Provide flagpoles capable of withstanding the effects of wind loads as determined according to NAAMM FP 1001, Guide Specifications for Design of Metal Flagpoles.
2. Base flagpole design on maximum standard size nylon flag suitable for use with pole or flag size indicated, whichever is more stringent.

2.03 POLE MATERIALS

A. Aluminum: ASTM B221 (ASTM B 221M) , 6063 alloy , T6 temper.

2.04 ACCESSORIES

A. Finial Ball: Aluminum, 6 inch diameter.

B. Truck Assembly: Cast aluminum; revolving, stainless steel ball bearings, non-fouling.

C. Cleats: 9 inch size, aluminum with stainless steel fastenings, two per halyard.

D. Cleat Box: Aluminum, with built-in hinge and hasp assembly, attached to pole with tamper proof screws inside box.

E. Halyard: 5/16 inch diameter nylon braided with steel or bronze core.

F. Connecting Sleeve For Multiple Section Poles: Same material as pole, precision fit for field assembly of pole, concealed fasteners.

2.05 MOUNTING COMPONENTS

A. Foundation Tube Sleeve: AASHTO M 36, corrugated 16 gage, 0.0598 inch steel, galvanized, depth of 36 inches.

B. Lighting Ground Rod: 18 inch long copper rod, 3/4 inch diameter.

C. Lightning Ground Cable: Copper No. 6 AWG, soft drawn.

2.06 FINISHING

A. Metal Surfaces in Contact With Concrete: Asphaltic paint.

B. Aluminum: Anodized to AA-C22-A42; Class 1, clear color

C. Finial: Spun Aluminum finish.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that concrete foundation is ready to receive work and dimensions are as indicated on shop drawings.

3.02 PREPARATION

A. Coat metal sleeve surfaces below grade and surfaces in contact with dissimilar materials with asphaltic paint.

3.03 INSTALLATION

A. Install flagpole, base assembly, and fittings in accordance with manufacturer's instructions.

B. Fill foundation tube sleeve with concrete specified in Section 03 3000.

C. Install foundation plate and centering wedges for flagpoles base set in concrete base and fasten.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1 inch.

3.05 ADJUSTING

A. Adjust operating devices so that halyard function smoothly.

B. Install the flagpoles in strict accordance with the manufacturer's recommendations as approved by the Architect, aligning plumb to a vertical tolerance of one in 1,000 and adjusting operating components for optimum smoothness of operation.

END OF SECTION

SECTION 11 2336
COMMERCIAL APPLIANCES

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Commercial Washer-Extractors

B. Commercial Drying Tumblers

C. Commercial Ice Machines

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete

B. Division 22 - Plumbing

C. Division 23 - Heating, Ventilating and Air-Conditioning

D. Division 26 - Electrical

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product data: Within 30 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
   1. Materials list of items proposed to be provided under this Section;
   2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
   3. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.04 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. The contractor shall furnish a written guarantee warranting all materials, devices, equipment and workmanship to be free of defects for a period of one (1) year from the date of completion and acceptance. Any defects in materials, devices, equipment and workmanship which become apparent within the guarantee period shall be repaired and replaced by the contractor at his own expense and at no additional cost to the Owner.

C. After the above one (1) year period of guarantee, the equipment shall be guaranteed for five (5) years in accordance with standard warranties as offered by the manufacturer.

D. Provide extended seven (7) year warrnaty for ice machine evaporator with water filtration system.

PART 2 – PRODUCTS

2.01 EQUIPMENT MANUFACTURERS

A. Ice-O-Matic (Commercial Ice Machines): www.iceomatic.com

B. Manitowoc Foodservice (Commercial Ice Machines): www.manitowocice.com

C. Substitutions: See Section 01 6000 - Product Requirements.

2.02 WASHER-EXTRACTORS/DRYING TUMBLERS - COMMERCIAL

A. Provide the following products:
   1. Washer-Extractor with the following attributes:
      a. Model: Speed Queen, SY55
      b. Capacity: 55 lb.
      c. Speed: 6-speed unit

d. Volume: 8.5 cu. ft.

2. Drying-Tumblers with the following attributes:
   a. Model: Speed Queen, ST075
   b. Capacity: 75 lb.
   c. Gas:
      1) Energy: 165,000 BTU/HR
      2) Electrical Requirements: 120/60/1
   d. Air Outlet: 8”

2.03 COMMERCIAL ICE MACHINES

A. Provide the following products:
   1. Ice Machine with Storage Bin:
      a. Model: Ice-O-Matic Elevation Series CIM1136A with Bin B110.
      b. 24 Hour Yield: 997 lbs.
      c. Condenser: Air
      d. Cube Size/Type: Full/Cube
      e. Storage Capacity: 854 lbs.
      f. Provide water filtration system including extended warranty.
      g. Electrical Requirements: 208-230/60/1

PART 3 – EXECUTION

3.01 INSTALLATION

A. This contractor shall do all fitting, fastening, connecting, leveling and placing of all Equipment as required to complete each item in its permanent position.

3.02 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. Demonstrate proper operation of equipment to Owner's designated representative.

3.03 SYSTEM STARTUP

A. Provide manufacturer's field representative to perform systems startup.

B. Prepare and start equipment and systems in accordance with manufacturers' instructions and recommendations.

C. Adjust for proper operation within manufacturer's published tolerances.

END OF SECTION

SECTION 11 3013
RESIDENTIAL APPLIANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Kitchen appliances.

B. Laundry appliances.

1.02 REFERENCE STANDARDS

A. UL (DIR) - Online Certifications Directory; Current Edition.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.

C. Copies of Warranties: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Electric Appliances: Listed and labeled by UL (DIR) and complying with NEMA Standards (National Electrical Manufacturers Association).

C. Gas Appliances: Bearing design certification seal of American Gas Association (AGA).

1.05 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Submit a written warranty, executed by the Manufacturer, agreeing to repair or replace equipment that fails in materials or workmanship within the specified warranty period.
   1. Warranty Period: One (1) year after date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements indicated herein, provide products of one of the listed manufacturers.
   1. Accurex, LLC: www.accurex.com.
   2. Denlar Fire Protection: www.denlarhoods.com.
   3. Frigidaire Professional: www.frigidaire.com.
   4. General Electric Appliances: www.geappliances.com.
   5. Hoshizaki America, Inc.: www.hoshizakiamerica.com.
   6. KitchenAid Appliances: www.kitchenaid.com.
   7. Summit Appliance: www.summitappliance.com.
   8. Whirlpool Corporation: www.whirlpool.com.
   9. Substitutions: Under provisions of Section 01 6000 – Product Requirements.

2.02 KITCHEN APPLIANCES

A. Refrigerator: Free-standing, top-mounted freezer, and frost-free.
   1. Basis of Design: GE, Model# GIE22JSNRSS
   2. Capacity: Total minimum storage of 21.9 cubic ft; minimum 15 percent freezer capacity.
   3. Features: Include glass shelves and automatic icemaker.
   4. Exterior Finish: Stainless steel.

B. Under Counter Refrigerator (ADA Compliant Height)
   1. Basis of Design: Summit Appliance, Model# AL54
   2. Surface: Stainless Steel
   3. Capacity: 4.8 Cubic foot minimum
   4. Dimensions: Depth: 22.63 in., Height: 32 in., Width: 23.63 in.
   5. Features: Frost-free

C. Under-counter Ice Maker (ADA Compliant Height)
   1. Basis of Design: Hoshizaki America, Inc., Model# C-80BAJ-AD
   2. Ice Type: Mini nugget, 1/4" x 3/8" x 5/8" x 1/2"
   3. Surface: Stainless Steel
   4. Dimensions: Depth: 22.62 in., Height: 31.5 in., Width: 14.87 in.
   5. Capacity: 22 lbs.

D. Range: Electric, free-standing, with glass-ceramic cooktop.
   1. Basis of Design (Electric - ADA): GE, Model# JS645SLSS
   2. Size: 30 inches wide.
   3. Oven: Self-cleaning.
   4. Burners: Four (4).
   5. Controls: Push-to-turn knobs with electronic clock and timer.
   6. Features: Include storage drawer, oven door window, oven light, and safety control lock out function.
   7. Exterior Finish: Stainless steel.

E. Cooking Exhaust: Range Hood (w/ Fire Protection)
   1. Basis of Design: Accurex, Model # XRRS-30 or Denlar, Model# 1030.
   2. Activation: Fusible Link
   3. Provide appliance and fuel disconnect
   4. Wet chemical extinguishing agent: Low PH Amerex 660
   5. Exhaust: Vented, vertical or side wall.
   6. Controls: Variable speed/on/off controls;
   7. Dimensions: Depth: 19.38 in., Height: 10.5 in., Width: 30 in.
   8. Color: Stainless Steel
   9. ADA - Handicapped Accessible Control Box

F. Dishwasher: Undercounter. (ADA Compliant Height - Must fit under 34" high counter)
   1. Basis of Design: GE, Model# GDT225SSLSS
   2. Controls: Solid state electronic.
   3. Wash Levels: Three (3).
   4. Cycles: Three (3), including normal and heavy or light wash.
   5. Features: Include rinse aid dispenser, optional no-heat dry, optional water temperature boost, adjustable upper rack, and adjustable lower rack.
   6. Finish: Stainless steel.

2.03 LAUNDRY APPLIANCES

A. Combination Stacked Washer/Dryer
   1. Basis of Design: GE, Model# GUD27ESSMWW
   2. Washer Capacity: 3.8 Cubic foot
      a. Surface/construction: Porcelain on steel, porcelain tub
      b. Features: 11 cycle, 4 water levels, 6 temperature settings, sound insulation
   3. Dryer Capacity: 5.9 Cubic foot
      a. Surface/construction: Porcelain on steel, cold rolled steel drum
      b. Features: 4 cycle, sound insulation
   4. Controls: Rotary controls

5. Dimensions: Depth: 31 in., Height: 76 in., Width: 27 in. nominal.
6. Color: Painted steel, color white.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify utility rough-ins are provided and correctly located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Anchor built-in equipment in place.

3.03 ADJUSTING

A. Adjust equipment to provide efficient operation.

3.04 CLEANING

A. Remove packing materials from equipment and properly discard.

B. Wash and clean equipment.

END OF SECTION

SECTION 11 4000
FOOD SERVICE EQUIPMENT

1.1 RELATED DOCUMENTS

A. The general provisions of the Contract, including General and Supplementary Conditions and General Documents, apply to the Work specified in this Section.

1.2 SUMMARY OF THE WORK

A. Project Name and Location: Tomball Intermediate School Replacement
Tomball, TX 77375

B. Approval of Working Surface: Any contractor performing work over the work of other contractors shall notify the Architect of any unsatisfactory conditions. The beginning of work by any contractor shall constitute acceptance of the previous work.

C. Field Verification of All Dimensions: Before ordering any materials or doing any work, field verify all measurements of the building and be responsible for their accuracy. No extras will be allowed for variations from drawings in existing conditions or work performed under this contract. Any discrepancies found shall be submitted to the Architect or Foodservice Design Professionals (FDP) for instructions before proceeding.

D. Cutting and Patching: No excessive cutting will be permitted, nor shall any structural members be cut without the written approval of the Architect. Each Contractor shall leave all chases and openings straight, true, and of the proper size in their work, as may be necessary for the proper installation of their and other contractors' work. After such work has been installed, the contractor shall carefully fit around, close, repair, patch, and point up the same as directed to the satisfaction of the Architect.

E. Cooperation: The General Contractor, all other contractors, and all subcontractors shall coordinate their work with all adjacent work and shall cooperate with all other trades to facilitate the general progress of the work. Each trade shall afford all the other trades every reasonable opportunity to install their work and store their material.

F. Inspection and Tests: The architect, Owner, Foodservice Design Professionals (FDP), and their representative shall always have access to the work, whether in preparation or progress. Provide proper and safe facilities for such access and inspection.

G. Fees, Permits, and Inspections: Secure and pay fees for all permits, licenses, and inspections as required by all authorities having jurisdiction. Give all notices and comply with all laws, ordinances, codes, rules, regulations, and contract requirements bearing on the work.

1.3 SCOPE OF WORK

A. Include the Work specified, shown, or inferable as part of Food Service Equipment. Portions of this Work may be subcontracted to those qualified to do such work as necessary because of jurisdictional trade agreements and restrictions.

B. The General Contractor is responsible for Related Work specified in other Sections: i.e., final plumbing, electrical and mechanical connections. The Kitchen Equipment Contractor (KEC) is responsible for all internal connections.

C. Specifications and drawings have been prepared to form the basis for procurement, erection, start-up, and equipment adjustment in this contract. Plans and specifications shall be considered mutually explanatory. Work required by one, but not by the other, shall be performed as though required by both. Items required by one but not by the other shall be provided as though required by both. Work shall be accomplished as called for in specifications and shown on drawings so that all equipment items shall be entirely functional for the purpose for which they were designed and intended. Provide all necessary material, tools, equipment, and labor required for the complete delivery, un-crating, erection, and installation as designated on the food service equipment plan and, in the specifications, to be made ready for final connection by the appropriate Division contractors. When there is any discrepancy between drawings and specifications, bidders should seek clarification of any discrepancies from the Architect and or Foodservice Design Professionals (FDP) before bidding.

D. Should the drawings disagree in themselves or the specifications with the drawings *(and clarification was not sought before bidding)*, the higher cost, better quality, more stringent, and greater quantity of the work or materials shall be completed without additional costs to the Owner.

1.4 OTHER DIVISIONS/CONTRACTORS RELATED WORK

A. Division 03 (Concrete) is responsible for but not limited to:

1. Slab depressions reinforced concrete wearing bed at prefabricated walk-in assemblies.

2. Concrete or masonry platforms (with a finished top and coved base at the perimeter) for the raised setting of food service equipment.

3. Slab depressions to receive stainless steel drain trench liner/grate assemblies (provided under this Section).

B. Division 09 (Finishes) responsible for but not limited to:

1. Interior finished floor with a coved base at prefabricated walk-in assemblies.

C. Division 10 (Specialties) responsible for but not limited to:

1. S/S Corner Guards throughout the kitchen (unless specified otherwise).

2. Lockers.

D. Division 22 (Plumbing) is responsible for but not limited to:

1. All connections shall be made in accordance with local codes and national standards, except where plans and specifications exceed those codes and standards.

2. Empty EMT conduit with pull-wire and wide-sweeping bends for beverage lines, refrigeration to beverage lines, CO2 lines, and all plumbing lines required for water-cooled equipment.

3. Rough-in and final connection of plumbing systems to food service equipment and between components (including materials and labor). Accessories provided loose with food service equipment by Section 11 40 00 to be field installed by Division 22. This includes but is not limited to the installation of all faucets (water fill faucets, pre-rinse faucets, etc.), hoses, gas disconnects and drains from the equipment point of connection to building plumbing systems. All drain lines are provided and installed by Div. 22.

a. Kitchen Equipment Contractor is responsible for providing all faucets (water fill faucets, pre-rinse faucets, etc.), drain fittings, mixing valves, control valves, water pressure regulators, vacuum breakers, and all accessories for equipment specified under 11 40 00. Division 22 is responsible for installation.

4. Indirect drain line runs from the equipment to the nearest drain or floor sink—lines to be type 'K' Copper.

5. If any plumbing accessories or fittings are provided loose with equipment by 11 40 00, Div. 22 is to attach to equipment and provide final connection.

6. Gas Supply Systems with all components and fittings required for a complete system.

7. Water Supply Systems with all components and fittings required for a complete system.

8. Compressed Air Systems with all components and fittings required for a complete system (if required for this project).

9. Piping and Drainage Systems (Sanitary and Grease-laden). ***Systems must be cleaned and flushed before the final connection with food service equipment - Critical.***

10. Floor Sinks (Provide and Install). Flange and grates to be flush with the finished floor.

11. Floor Drains (Provide and Install). Flange and grates to be flush with the finished floor.

12. Trench Drains (Provide and Install). Trench Liners provided by 11 40 00. Flange and liners to be flush with the finished floor.

13. Grease Traps as required (Size, Provide, Locate, and Install). Verify with local codes to bypass or pipe through Grease Trap and/or Interceptor.

14. P-Traps as required (including all disposers).

15. Interconnect water through Water Filter (Filter provided by 11 40 00 unless otherwise specified) to equipment.

16. Gas Quick Disconnect Installation (Quick Disconnect provided by 11 40 00).

17. Safety Restraint Cable Installation (Safety Restraint Cable Provided by 11 40 00).

18. Specified couplings and piping to all equipment furnished by 11 40 00.

19. Air Compressors (if required for this project) (Size, Provide, and Install unless otherwise specified).

20. Water Softeners (if required for this project) (Size, Provide, and Install unless otherwise specified).

21. Pressure Boilers (if required for this project) (Size, Provide, and Install unless otherwise specified).

22. Hand Sinks (Provide (unless otherwise specified) and Install). Provide a hot water tempering valve if required. Water temperature to be at least 100 degrees and flow for at least 20 seconds.

23. Ice Bin Drain Insulation (if Ice Machine is provided in this project) (Provide and Install).

24. Unions at disposer solenoid valves (if Disposer is provided in this project) (Provide and Install).

25. Back Flow Prevention as required (Provide and Install - including all disposers). Back-Siphonage shall be installed at all fixtures and equipment where backflow and/or back-siphonage may occur and where a minimum air gap cannot be provided between the water to the fixture or equipment at its flood/level rim. When furnished with equipment, vacuum breakers shall override the above if acceptable with applicable codes. Division 22 is responsible for verifying requirements with local codes.

26. Janitor Sink with Faucet (Provide and Install).

27. Freeze Proof Hydrant at the exterior of the building by receiving door (Provide and Install - unless otherwise specified).

28. Reverse Osmosis Systems (Size, Provide (unless otherwise specified), Locate, and Install).

29. All piping within the counter body or under fabricated counters must be run to a connection point below the counter body by Section 11 40 00—final connection by Division 22.

30. Exhaust Hood condensate drain connections (if Exhaust Hood is provided in this project) (Provide and Install).

31. Interconnection of ½" CW to Pre-Rinse and Disposers cone/body inlets piped through the solenoid and vacuum breaker (if Disposer is provided in this project).

32. Fire System Piping. The exposed piping is to be chrome plated.

33. Pipe ½" cold water to swirl inlets at disposers (if Disposer is provided in this project).

34. Water Treatment for Ice Builders (Non-chlorinated water with a pH level of 10 or higher) and any drains and overflows. Piping from Ice Builders to Tumble Chillers by Div. 23 (if Ice Builders and Tumble Chillers are provided in this project).

35. Manifold drain lines together for all multi-compartment sinks (two-compartment, three-compartment, etc.).

36. Refer to Section 2.2 PLUMBING / MECHANICAL REQUIREMENTS for additional information.

E. Division 23 (Mechanical) responsible for but not limited to:

1. All connections shall be made following local codes and national standards, except where plans and specifications exceed those codes and standards.

2. Rough-in and final connection of mechanical systems to food service equipment, walk-in assemblies, and between components (including materials and labor).

3. A mechanical contractor will test and balance rooms and exhaust hoods. **Balance report for food service Exhaust Hoods to be provided to Foodservice Design Professionals (FDP) immediately upon completion (send to Houston.Submittal@fdp.org) and must be submitted with O&M manuals.**

4. Exhaust Hoods, Condensate Hoods, Fire Suppression Systems, connections, and controls (Provide and Install – unless otherwise specified). Provide tempered air at all supply ducts.

    a. If Exhaust/Condensate Hoods and Fire Suppression Systems are specified under Section 11 40 00, Division 23 is responsible for all Exhaust and Condensate Hood connections (Provide and Install).

5. VFD System and controllers when required by code (Provide and Install).

6. Provide and install all ventilation (direct or indirect), air conditioning, and heating systems (unless otherwise specified).

7. Coordinate Supply and Return ducts above Serving Counters. No cold air is to blow directly on hot food counters or open-air refrigerated merchandisers.

8. Coordinate Supply and Return ducts away from equipment with top-mounted refrigeration. No cold air is to blow directly on compressors.

9. Mechanical Contractor to locate temperature monitors within return ducts.

10. Circulating air above walk-in assemblies (Provide and Install).

11. Circulating air above and in air gaps at warehouse cold storage assemblies (Provide and Install).

12. Water Chillers as required (if equipment is provided in this project) (Provide, Size, and Locate).

13. Piping from Ice Builders to Tumble Chillers (if equipment is provided in this project) (Size, Provide and Install).

14. Refer to Section 2.2 PLUMBING / MECHANICAL REQUIREMENTS for additional information.

F. Division 26 (Electrical) responsible for but not limited to:

1. Rough-in and final connection of electrical systems to food service equipment, walk-in assemblies, and between components (including materials and labor). Accessories provided loose with food service equipment by Section 11 40 00 to be field installed by Division 26.

2. Empty EMT Conduit with pull-wire and wide-sweep bends for remote refrigeration evaporator control wires, temperature monitor panel, and emergency alarm/strobes as required.

3. Empty EMT Conduit with pull-wire and wide-sweep bends for interconnect cables between LAN and POS terminals, change-makers, pre-check units, printers, CPUs, etc. Division 26 to verify where the conduit will run for POS System (i.e., Manager's Office or IDF Room).

4. Empty EMT Conduit with pull-wire and wide-sweep bends for fire suppression systems. Interconnect the Fire Protection System to panel box shunt trips and building alarm.

5. Walk-in Assembly Light Fixture Installation (Provided loose by Section 11 40 00) (if Walk-in is provided in this project).

6. Table Limit Switch (Provided loose by Section 11 40 00) (if Dishmachine is provided in this project) – Install and interconnect to Dishmachine.

7. Electrical Materials and Devices (Shunt-trip breakers, surge protectors, lighting control devices, conduit, wire, etc.).

8. Switches and Stainless Steel Disconnects as required (Provide, Locate, and Install – to be in an accessible location).

9. Charging Stations for Forklifts, Pallet Stackers, and Pallet Jacks (Size, Provide, Locate, and Install) (if equipment is provided in this project).

10. Interconnection between Condensate Fan and Dishmachine control panel (if equipment is provided in this project).

11. Interconnection between Exhaust Hood fans and switch (if equipment is provided in this project).

12. Interconnection between Exhaust Hood lights and switch (if equipment is provided in this project).

13. Door Heaters, Lights, Coils, and Heated Pressure Relief Ports pre-wired to the junction box at the top of walk-in assemblies (if equipment is provided in this project) provided by Section 11 40 00—final connection by Div. 26.

14. If any electrical accessories, fittings, and cord/plugs are provided loose with equipment by 11 40 00, Div. 26 is to attach to equipment and provide final connection.

15. Provide waterproof receptacles in wet areas.

16. All electrical connections beneath Exhaust Hoods (if equipment is provided in this project) to extend to shunt trip breakers with electrical panel box for shutdown during fire mode.

17. Receptacles will be pre-wired to Junction Box or Load Center for final connection by Division 26.

18. All electrical lighting, power, and distribution systems.

19. Do not interconnect more than three (3) convenience outlets on one (1) breaker.

20. Other than convenience outlets, all electrical connections on food service plans are dedicated breakers.

21. Doorbell at receiving door (Provide and Install –audible throughout Kitchen, Office, and Dry Storage room).

22. Adequate lighting at receiving door.

23. (if Walk-in is provided in this project) Walk-in Manufacturer is to provide Three (3) Edwards 860 Series (or equal) red lens, surface-mounted Xenon Emergency Strobe Beacons. Div 26 will install One (1) located in the Kitchen in architectural ceiling above Walk-In Cooler door, One (1) located in the Kitchen in architectural ceiling above Walk-In Freezer door, and the third unit located in the Cafetorium (Division 26 to coordinate location with Owners and Architect). Division 26 is to provide all conduit and wiring required and interconnect the illuminated Push Button Panic Alarm in the Walk-In Cooler and Freezer to all Strobe Beacons (***Critical***). Coordinate with Division 27.

24. Dedicated circuit for heated drain line connection in Walk-In Freezer (120/1/16.0 Amp) at each coil (if Walk-In is provided in this project).

25. GFCI Breaker for all receptacles under Exhaust Hoods (if Hoods are provided in this project) and Holding Cabinets (if Holding Cabinets are provided in this project), to be located within Kitchen's electrical Breaker Panel and not at the receptacles.

26. Remote GFCI reset switches to be accessible to end user.

27. All electrical below Exhaust Hoods (if Hoods are provided in the project) are to have Shunt Trip Breakers.

28. Interconnect Temp Sensor to Exhaust / Supply fans (if Hoods are provided in this project).

29. Electrical contractor to provide conduit with pulled wires prior to installation of equipment.

30. Refer to Section 2.5, ELECTRICAL REQUIREMENTS, for additional information.

G. Division 27 (Communication) responsible for but not limited to:

1. Data line coordination for food service equipment.

2. Time clocks as required.

3. Video cameras for learning assistance in food service areas as required (Provide, Locate, and Install).

4. (if Walk-in is provided in this project) Provide conduit, data line, and interconnect the illuminated Push Button Panic Alarm inside the Walk-In Cooler and Freezer to the Building Automation System (BAS). When activated, facility personnel are to be notified - coordinate notification requirements with the Owner (***Critical***). Coordinate with Division 26.

5. (if Walk-in is provided in this project) Provide conduit, data line, and interconnect Leak Detection System to Building Automation System or Owner alarm system as maybe be required for communication of alarm to Owner.

H. Division 28 (Electronic Safety and Security) is responsible for but not limited to:

1. Security Cameras as required (Provide, Locate, and Install).

I. General Contractor responsible for but not limited to:

1. Any wall penetration required for food service equipment utilities. Escutcheon plates or S/S sleeves are to be provided and installed as needed.

2. Bulk Freezer Ventilation Pipe (if Bulk Freezer is provided in this project) (Provide and Install unless otherwise specified).

3. Core drilling for Guide Rails (if Guide Rails are provided in this project).

4. Refrigeration Roof Curbs / Roof Jack (if Refrigeration System is provided in this project and located on the roof).

5. Interior Bollards (if required for this project) – to be epoxy painted per local codes (Provide and Install).

6. Furnish and Install ¾" Plywood blocking in the wall for mounting equipment furnished by Section 11 40 00 as required.

7. Walk-in Depressions (to be dead level) and sand leveling bed (if Walk-in is provided in this project and recess is shown).

8. Structural bracing for Bulk Walk-in Assembly ceiling panels if required.

9. Menu System Video Monitors in Servery (unless otherwise specified).

10. Structural bracing for Menu System Video Monitors if required.

11. Interior/Exterior refrigeration penetrations and sleeves at building penetrations.

12. DoorScope viewer (peephole) with wide viewing angle at receiving door.

13. Canopy at receiving door. Coordinate height with the height of Receiving Door (8') and the mounting height of Air Screen above the door.

14. Soap and towel dispenser provided by Owner. G.C. is responsible for installation.

15. Washer and Dryer (Provide and Install, unless otherwise specified).

16. Dwarf wall at exposed front/ends of cafeteria serving counters with the finish as selected by the Architect (if required in this project).

17. Substrate (Provide and Install) at SS Wall Caps for pony walls.

18. Final cleaning of all equipment before demonstrations.

1.5 QUALITY ASSURANCE

A. In addition to complying with all applicable laws, statutes, building codes, and regulations of public authorities, comply with the following:

1. National Sanitation Foundation (all equipment to bear label)

2. National Electric Code

3. Underwriters' Laboratories, Inc. (all applicable equipment to bear label)

4. American Gas Association Laboratories

5. National Fire Protection Association

6. Americans with Disabilities Act

7. Food and Drug Administration HAACP Guidelines

8. International Energy Conservation Code (IECC)

9. Department of Energy

10. Environmental Protection Agency

11. CSA Group

B. Furnish certification of regularly manufactured equipment listing or classification by Underwriters Laboratories, Inc., with the initial submittal.

C. Furnish a list of equipment and components (internal and external) that are not of domestic origin. All equipment and components (internal and external) should be of domestic origin when possible. This information should be provided with the initial submittal.

D. Projects outside the continental United States shall adhere to all local authorities having jurisdiction over that project.

1.6 SUBSTITUTIONS

A. **The specified equipment items or components are intended to be the basis of the bid. All other brands, including any additional names, which may be listed as "Alternates" or "Approved Equal," must conform with the general and item specifications, warranties, size/dimensions, quality, accessories, function, voltage, horsepower, etc. of the first-named brand and be subject to Paragraph C-03 of this Article.**

B. Proposed Substitutions:

1. Submitted at least 14 calendar days before Bid Date.

2. Submit proposed substitutions with catalog data and manufacturer's shop details indicating all modifications required to conform with the specified brand.

3. List of deviations must include equipment name, model number, accessories, and features with deviation(s) noted for specified and proposed alternate equipment. Equipment without listed deviation(s) will be considered furnished as specified.

C. Substitutions with prior approval:

1. Submitted on Bidder's letterhead attached to Proposal Form with individual additive/deductive amounts stipulated and the documentation required in Paragraph B-02.

2. Owner reserves the right to accept or reject any or all substitution proposals before execution of the Contract.

3. Provide all design/engineering services required to adjust in space, systems, utilities, etc., and pay all additional costs of utilities, construction, or professional services that may be incurred due to the acceptance of any substitution.

D. All appliances or other equipment within a common group or category (e.g., refrigerators, kettles, ovens, shelving, etc.) must be from the same manufacturer.

1.7 INTERPRETATION OF DOCUMENTS

A. During Bidding: Bidder's, supplier's, or vendor's questions and comments about Construction Document's clarity or intent will be addressed by addendum.

B. After Award:

1. Clarification Bulletin will confirm Construction Document requirements.

2. Request for Information submitted by Contractor shall contain Contractor's proposed resolution.

1.8 WARRANTY

A. Provide a written warranty for parts and labor for one year ***from the date of Substantial Completion***, including an extended four-year replacement warranty on compressor bodies.

B. Components of equipment subject to replacement before one year's use (such as refrigerator door gaskets) and those items which may fail due to improper or inadequate periodic maintenance by the Owner/Operator (such as an uncleaned refrigeration system condenser) are not intended to be included within the scope of the Warranty.

C. Refrigeration Systems/Equipment: One-year free service available within twenty-four hours of notification.

D. Furnish three copies of a list of all equipment and their respective local service agencies, indicating the address, telephone number, and name of the person to contact. The service agencies selected shall be factory-authorized for the equipment assigned whenever possible.

E. Provide the following for refrigeration systems/equipment unless specified otherwise:

1. One (1) year of free refrigeration system service is available within twenty-four hours of notification.

2. Provide five (5) year manufacturer's registered written replacement warranty certificate covering compressor bodies. Warranty to cover labor costs for the first year.

3. Provide ten (10) years of the manufacturer's registered written replacement/repair warranty certificate covering walk-in assembly panels. Warranty to cover defects in material and workmanship. Warranty to cover labor costs for the first year.

4. Provide two (2) year parts and labor warranty for ***all parts/components (including third-party components that may be utilized)*** of the refrigeration system(s) ***(including freon)***, walk-in cooler(s), and freezer(s) not otherwise covered herein.

F. ***All above-stated warranty periods are from the date of Substantial Completion***. All replacement parts due to a warranty call should be the same quality as the original, or better if the original were defective. Replacement parts should be of domestic origin where possible.

1.9 SUBMITTAL DATA

A. **All submittals must be received, reviewed, and approved as noted prior to equipment procurement. If any equipment is procured prior to this process, it is on the KEC to replace any equipment, accessories, or other components that may not meet the specifications or design intent for the facility, including all costs associated with rectifying the errors made in procuring the equipment before this critical process.**

B. Special Requirements: The following are in addition to any general requirements given elsewhere in the Documents.

C. Submittal Requirements:

1. Kitchen Equipment Contractor to furnish all submittals via PDF, drawings to be scaled per General Specifications and provided in Three (3) submittal packages.

2. Foodservice Design Professionals requires the below-listed business days for each package submitted. Packages are to be submitted within 14 days between each issued package. Each package should contain individual submittal sets.

    a. Package One to include (2) Individual sets: 10 Business Days for Review

        i. Equipment rough-in

        ii. Equipment Brochure

    b. Package Two to include (3) Individual sets: 10 Business Days for Review

        i. Exhaust Hoods

        ii. Walk-in Cold Storage Assemblies

        iii. Refrigeration

    c. Package Three to include (4) Individual sets: 15 Business Days for Review

        i. Custom Fabrication

        ii. Serving Counters

        iii. Merchandising Equipment

        iv. Miscellaneous Submittals

D. Submittals to be identified with the below-listed file name structure:

1. 11 40 00-1 EQUIPMENT BROCHURE
2. 11 40 00-2 EQUIPMENT ROUGH-IN PLANS
3. 11 40 00-3 CUSTOM FABRICATION
4. 11 40 00-4 SERVING COUNTER
5. 11 40 00-5 EXHAUST HOODS
6. 11 40 00-6 WALK-IN COLD STORAGE ASSEMBLY
7. 11 40 00-7 REFRIGERATION
8. 11 40 00-8 BEVERAGE MERCHANDISER

E. Package One (1) requires both submittals: Brochure and Rough-in plans. **If not sent together, the submittal will be rejected.**

F. Foodservice Design Professionals (FDP) will notate all submittals in RED. Architects and General contractors will be notated in color per their direction.

G. If hard copy submittals are required, Kitchen Equipment Contractor will furnish all copies to the specified trades as required.

H. If discrepancies, missing information, or incorrect information occur within the documents, Kitchen Equipment Contractor is to seek clarification or note the need for further direction on

submittals. The Kitchen Equipment Contractor is to bid the higher of the discrepancies. *Refer to Section 1.3 SCOPE OF WORK: Subsection D.*

I. Brochure Format (for regularly manufactured equipment and components):

1. Front and rear protective cover with labeled project name.

2. Brochure index: Indicate Functional Area/Room number, item number, quantity, description, and manufacturer.

3. A separate flysheet for each component or item of equipment, indicating item number, name, quantity, manufacturer, optional equipment, modifications, special instructions, and utility requirements. Any equipment or assembly containing more than one buyout sub-assembly or component shall have the second item listed in parenthesis beside the primary item name—for example, Serving Counter (hot food well).

4. Catalog specification sheet with all options notated on the specification sheet and manufacturer's drawing.

J. Shop Drawings (Rough-In Drawings):

1. Separate drawing sheets: same size as Contract Drawings (Contract Drawings are not to be traced or reproduced). Submittal drawings are to be provided by Kitchen Equipment Contractor and not copied or reproduced from Contract Documents. Any reproduced submittal drawings will be rejected.

2. ¼" scale drawing of fixed/movable food service equipment and prefabricated Walk-in assemblies with itemized schedules.

3. Special Conditions Drawings, sizing, and locating the following conditions:

   a. Slab depressions, cores, sleeves, or block-outs (walk-in assemblies, drain trenches, piping, etc.).

   b. Concrete or masonry platforms.

   c. Pipe sleeves or roof jacks.

   d. Wall openings or block-outs for pass-through equipment, recessed control panels, in-wall fire-protection system components, etc.

   e. Blocking grounds or anchor plates required in walls for equipment support/attachment.

   f. Above-ceiling hanger assemblies for support of exhaust hoods, ceiling-mounted pot racks, etc.

   g. Access panels in walls or ceiling for service of equipment.

   h. Ceiling pockets or recesses for unusually high equipment.

   i. In-wall carriers for wall-hung or cantilevered equipment.

4. Electrical Rough-In Drawing

5. Plumbing and Mechanical Rough-In Drawing

6. Required information:

   a. All fixed and portable food service equipment shown on Contract Drawings.

   b. All prefabricated Walk-In Assemblies and Conveyor/Dishtable Assemblies shown on Contract Drawings.

   c. All general-use and convenience utilities or services indicated on Contract Drawings, including those required by or connected to equipment or devices, not in this Section.

   d. All Rough-In Drawings: Fully dimensioned from engineering benchmark (column lines, when provided) and finished-room surface to the point of stub-up through floor and stub-out through wall or ceiling for all mechanical, electrical, and plumbing services.

   e. Connection number/tag system and symbols: Identical to Contract Drawings.

K. Shop Drawings (Manufacturer's and Fabricator's):

1. Sheet Size: Identical to Contract Drawings, drawn or plotted at a ¼" scale for plan view, ½" for elevations, and 1½" for sections and construction details.

2. Included information: The item number, name, and quantity.

3. Construction details, sections, and elevations to reflect the requirements of the Specifications and Drawings.

4. Indicate adjacent walls, columns, and equipment.

5. Indicate plumbing and electrical schematic drawings for equipment such as conveyors, waste systems, self-cleaning exhaust hoods, exhaust hood fire protection systems, and fabricated fixtures with a single electrical or plumbing connection.

6. Mechanical or electrical operating components or products integrated into a fabricated fixture: ventilation and service access required or recommended by the manufacturer, including panel size and location to permit easy lubrication, adjustment, or replacement of all moving parts.

L. All equipment and engineering rough-in plans sheet numbers are to match the contract documents. All equipment item numbers and engineer item numbers located on the schedules are to match the contract documents. All engineering requirements must be updated to accommodate the provided equipment and match the contract documents. The Kitchen Contractor coordinates any MEP revisions to accommodate the supplied and proposed equipment. The Kitchen Equipment Contractor is responsible for any costs associated with equipment substitution.

M. Foodservice Design Professionals (FDP) drawings and schedules are not to be copied in any way. Any replicated drawings of Foodservice Design Professionals (FDP) will be rejected.

1.10 SERVICE MANUAL

A. Three copies bound in 1½" hardback, three-ring binders (as many volumes as required by the scope of the project) with the same data as the brochure after installation (Refer to "Submittal Data"). Provide separate service manuals for each independent area within the project scope (Main Kitchen, Culinary, Concession, etc.).

B. Each Volume: Section for maintenance of finish materials (e.g., stainless steel, plastic laminates, FRP, Plexiglas, etc.).

C. Catalog specification sheet and/or manufacturer's shop drawings, including wiring diagrams when applicable.

D. Each Volume: Index of items, manufacturer's operating/maintenance information, replacement parts data, list of all product warranties, and price lists. Provide the name, title, and address of personnel at each respective manufacturer and service personnel to be contacted for spare/replacement parts and service after the warranty period.

E. To the greatest extent possible, provide two copies of the manufacturer's instructional video cassettes for operating, maintenance, and equipment service.

F. Internally subdivide binder contents with permanent page dividers, logically organized by equipment item number or manufacturer name, with tab titling printed under reinforced, laminated plastic tabs.

G. Electronically submitted manuals must follow the formatting requirements listed above.

H. **Service Manual to be provided to the owner before kitchen equipment demonstration.**

1.11 VERIFICATION AND COORDINATION OF PROJECT / DATA

A. Utilities Rough-in Drawings and field verifications are to be completed within four weeks after receipt of notice-to-proceed. Review Contract Drawings and Submittal Data for accuracy and completeness and notify Architect of conflicts and proposed adjustments. Coordinate work with other sub-contractors.

1. KEC to provide on-site field verification of all underground utilities before pouring concrete for capacity and location and coordinate with General Contractor. Submit a review to Architect and General Contractor. If rough-ins need to be relocated, KEC will compensate other trades for the required relocation.

2. KEC to provide on-site field verification of all other utility connections and locations and coordinate with General Contractor. Submit a review to Architect and General Contractor.

B. On-Site Inspection Reports

1. Before concrete pour: The Kitchen Equipment Contractor is to submit a copy of the report below to the Architect, General Contractor, and Foodservice Design Professionals (FDP) within 24 hours of the inspection. The form to be submitted is contained within these General Specifications.

2. Before delivery of equipment: The Kitchen Equipment Contractor is to submit a copy of the report below to the Architect, General Contractor, and Foodservice Design Professionals (FDP) within 24 hours of the inspection. The form to be submitted is contained within these General Specifications.

FOODSERVICE DESIGN PROFESSIONALS

0n - Site Inspection Report

Prior to Concrete Pour

Inspection Date_____ **Project Name** _____

Project Location_____

Inspector's Name_____ **Company** _____

Inspector's Contact Number_____ **Email** _____

Architectural Firm_____ **Project Architect** _____

Architect's Contact Number_____ **Email** _____

General Contractor_____ **Project Manager** _____

G.C. Contact Number_____ **Email** _____

Food Service Consultant Foodservice Design Professionals, LLC **Project Manager**_____

Contact Number 281.350.2323 **Email** _____

An on-site Inspection to verify the location of UNDERGROUND utilities was conducted on this date. The following conditions were observed and brought to the attention of the General Contractor. (KEC is to provide a written description and copy of the Utility Plan indicating the corrective action required).

1. What difficulties were encountered?

Inspector's Initials _____

This Inspection Report is the responsibility of the Kitchen Equipment Supplier and the General Contractor. Coordination between the two parties is mandatory.
Neither the Architect nor FDP need to be present at these inspections.

EMAIL A COPY OF THIS REPORT AND ANY ADDITIONAL INFORMATION TO THE ARCHITECT, GENERAL CONTRACTOR AND FOODSERVICE DESIGN PROFESSIONALS, LLC.

FOODSERVICE DESIGN PROFESSIONALS

CSA INSTALLATION APPROVAL REPORT

Report Date_____ **Project Name** _____

KEC Firm_____ **Phone Number**_____

Contact Name_____ **Email** _____

- ☐ **Walk-In panels are installed square, plumb, and level. Inspected prior to interior concrete pour.**
- ☐ **Ceiling panels are installed flush and tight to wall panels with undamaged gasket material. Any signs of condensation at joints or walls should be reported to FDP and addressed immediately. Caulk at panel seams will not be an acceptable solution.**
- ☐ **All cam-locks are engaged, and buttonholes are in place.**
- ☐ **Gaps under the screed or floor angle (due to shimming) are entirely sealed to the slab.**
- ☐ **Penetrations in the ceiling or wall panels are insulated and sealed.**
- ☐ **Weatherproofing / thermal barrier material is installed.**
- ☐ **All sharp edges of metal doors and diamond treadplate are clean of sharp edges and deburred.**
- ☐ **Door bumper or wall protection is installed and located as to prevent damage of door to adjacent walls.**
- ☐ **Cove base installed at all wall bases internal and external of walk-in.**
- ☐ **Door systems are correctly installed, and the door is self-closing and seals around the opening perimeter and at the floor threshold. Threshold has a smooth and level transition.**
- ☐ **Upon completion of the electrical connections, confirm the final operation of the IC/IC+ control, door heaters and light switches.**
- ☐ **Entrapment hardware and alarm systems are installed and functioning.**

KEC SIGNATURE_____

COMMENTS_____

_____

EMAIL A COPY OF THIS REPORT AND ANY ADDITIONAL INFORMATION TO THE ARCHITECT, GENERAL CONTRACTOR AND FOODSERVICE DESIGN PROFESSIONALS, LLC.

FOODSERVICE DESIGN PROFESSIONALS

On - Site Inspection Report

Prior to Delivery of Equipment

Inspection Date_____ **Project Name** _____

Project Location_____

Inspector's Name_____ **Company** _____

Inspector's Contact Number_____ **Email** _____

Architectural Firm_____ **Project Architect** _____

Architect's Contact Number_____ **Email** _____

General Contractor_____ **Project Manager** _____

G.C. Contact Number_____ **Email** _____

Food Service Consultant Foodservice Design Professionals, LLC **Project Manager**_____

Contact Number 281.350.2323 **Email** _____

An on-site Inspection to verify the location of INSTALLED utilities was conducted on this date. The following conditions were observed and brought to the attention of the General Contractor. (KEC is to provide a written description and copy of the Utility Plan indicating the corrective action required).

1. What difficulties were encountered?

Inspector's Initials _____

This Inspection Report is the responsibility of the Kitchen Equipment Supplier and the General Contractor. Coordination between the two parties is mandatory.
Neither the Architect nor FDP need to be present at these inspections.

EMAIL A COPY OF THIS REPORT AND ANY ADDITIONAL INFORMATION TO THE ARCHITECT, GENERAL CONTRACTOR AND FOODSERVICE DESIGN PROFESSIONALS, LLC.

FOODSERVICE DESIGN PROFESSIONALS

REFRIGERATION INSTALLATION APPROVAL REPORT

Report Date:_____ **Project Name:**_____

KEC Firm:_____ **Phone Number:**_____

Contact Name:_____ **Email:** _____

- ☐ Condensing unit is installed level with prescribed clearances on all sides. Condensing unit is bolted down with corrosion-resistant bolts. Housing is S/S with stand/skirting specified.
- ☐ Refrigeration lines have been adequately tested under pressure for leaks. Refrigeration lines running along the exterior of the building are insulated and wrapped in an aluminum jacket.
- ☐ Building Penetration for refrigeration lines is sealed by GC.
- ☐ All electrical connections are made tight with the correct voltage/phase orientation, with breakers/fuses and line disconnects set to match the connections.
- ☐ Water-cooled systems have all connections tight and leak-free with proper water pressure. Water Gauges are fully visible as required for maintenance and service.
- ☐ All gas leak systems are installed with appropriate shut-off mechanisms and connections made for alarms and interconnection to building automation systems.
- ☐ Evaporators hung at the locations indicated in the contract documents. All units have proper structural support.
- ☐ Penetrations in the ceiling or wall panels are insulated and sealed with clean workmanship.
- ☐ Cooler condensate drain line is copper, fully insulated, and adequately supported the length of the line run.
- ☐ Freezer condensate drain line is copper, fully insulated and properly supported the length of the line run, has connected heat trace throughout, and does not have a P-Trap inside the Freezer.
- ☐ Condensate drain line has a P-Trap outside of the cold storage assembly with a funnel at the floor drain.
- ☐ Air temperature sensor located at the rear of the evaporator coil must be positioned 4-6” away from the coil surface.
- ☐ All control wires run tight and secured to walls to prevent pulling or snagging.
- ☐ Magnetic switches are interconnected with coils to shut off when doors are opened. Shut-off control wired to the panic button, shutting off when the panic alarm is engaged.

KEC SIGNATURE_____

COMMENTS_____

_____

EMAIL A COPY OF THIS REPORT AND ANY ADDITIONAL INFORMATION TO THE ARCHITECT, GENERAL CONTRACTOR AND FOODSERVICE DESIGN PROFESSIONALS, LLC.

C. Review critical systems/components for application, performance, and capacity and submit calculation worksheets with the initial submission of brochure/rough-in drawings, with all proposed adjustments noted, including:

1. Exhaust hood removal/supply air volume, velocity, static pressure, duct collar sizes, and locations.

2. Refrigeration Systems (compressor, condenser, and evaporator) capacities/sizes, quantities, and refrigerant piping distances/sizes.

3. Exhaust Hood Fire Suppression Systems (nozzle locations, air handler, fuel interlocks, piping/distance limitations).

4. Locations of Vacuum Breakers.

5. Conformance of Refrigerated Components/Equipment with HACCP Guidelines (e.g., salad/sandwich pans, upright/open refrigerator cabinets, salad bars) with HACCP Guidelines.

6. Gas and water line sizes and manifold configurations.

7. Diameter and length of flexible connector lines for fixed/movable gas appliances.

8. Fabricated Equipment load center panels (individual and total amperage calculations and circuit balance).

9. ADA compliance of workstations, service positions, passageways, etc.

D. Ceiling mounted appliances/fixtures: Verify and coordinate dimensions/location of support framing/hangers with the General Contractor—all material and installation below 12’-0” AFF: Section 11 40 00.

E. Dimension Responsibility: Obtain actual or guaranteed measurements for the proper equipment fit. All dimensions indicated in Contract Documents are approximate and are as accurate as can be determined at the time. Field-check all horizontal/vertical measurements and conditions at the building before fabrication or delivery of equipment and notify the Architect of all conflicts or deviations from the dimensions shown.

F. Checking Dimensions at Site: Before ordering any materials or doing any work, verify all measurements of the building and be responsible for their correctness. No extras will be allowed for variations from drawings in existing conditions or work performed under this contract. Any discrepancies found shall be submitted to the Architect for instructions before proceeding.

G. Scheduling to Fit Openings: Should it become necessary to schedule the construction of walls or partitions before delivery of fixed equipment, the equipment must be fabricated for passage through finished openings. Maintain close contact with the project and be cognizant of all conditions, including vertical handling limitations within the building (elevator cabs or openings, stairs, etc.) and possible hoisting requirements. Coordinate all procedures with General Contractor and Project Team.

H. Refrigerated and Dry Storage Areas: Verify and coordinate dimensions to accommodate scheduled modular shelf sections. Notify Architect of the variance between the Contract Documents and actual conditions.

I. Color/Pattern Selections: Submit selection samples of solid polymer products, plastic laminate, paint or stain finishes, and vinyl-coated surface material of equipment as selected by the Owner.

J. Movable Equipment Interface: Rolling stock (pan racks, carts, dollies, dish/tray/rack dispensers) required to fit through or into fixed equipment (roll-in refrigerators, counter bodies, etc.) is to be reviewed and coordinated for compatibility at the time initial of shop drawing submittal. Indicate conflicts and proposed adjustments.

K. Relocation of Work: Relocate or re-route work as required to coordinate related items free of charge if no extra work is involved.

L. **Kitchen Equipment Contractor must provide FDP with the food service equipment lump sum pricing (including material and labor) after the contract has been executed and *before submittals* are provided to FDP. *This information is critical to FDP for accounting/billing purposes.***

1.12 EQUIPMENT FURNISHED / INSTALLED BY OTHERS

A. Obtain and coordinate utility requirements of Owner-Furnished/Owner-Installed (OF/OI) equipment with the building utilities and rough-in drawings/provisions.

B. Coordinate physical data of OF/OI appliances or equipment and incorporate information into Submittal Drawings. Vendor- or Purveyor-Furnished equipment (e.g., coffee/tea equipment): same as OF/OI.

1.13 WORK INSTALLED BUT FURNISHED BY OTHERS

A. Coordinate delivery/installation schedule of Owner-Furnished/Contractor-Installed (OF/CI) equipment with the Owner at least ninety (90) days before equipment requirement.

B. Obtain and coordinate utility requirements of OF/CI equipment with the building utilities and rough-in drawings/provisions.

C. Receive at the job site and fully incorporate into installation procedures as if furnished under this Section.

PART 2 - PRODUCTS

2.1 FABRICATED FIXTURES MATERIAL / COMPONENTS

A. Stainless steel sheets or shapes: 18-8, Type 302, polished to 180 grit No. 4 finish.

1. Stainless steel joints and seams: Heli-arc welded, free of pits and flaws, ground smooth, and polished to a No. 4 finish.

2. The “grain” direction of horizontal stainless-steel surfaces: Longitudinal, including the backsplash. The polishing procedure at right-angle corners of fixtures shall provide a mitered appearance.

B. Galvanized Iron Sheets: Armco copper bearing Zinc Grip or Zinc Grip/Paint Grip.

1. Galvanized iron joints and seams: Arc-welded, free of pits, flaws, and ground smooth.

2. Galvanized sheets or shapes: Washed with mineral spirits and painted with Rust-Oleum gray semi-gloss enamel.

C. Sound Deadening: Schnee Butyl Sealant ½" wide rope positioned continuously between all frame members or contact material and underside of stainless-steel surface (sinks, tabletops, food wells, over shelves, and undershelves). Tighten stud bolts for maximum compression of sealant and trim excess.

D. Plastic Laminates: Color/pattern selected by Architect, in 1/16" thickness for flat surfaces: 1/32" thickness for radiused surfaces. Plastic laminates and adhesives must be NSF-approved (Standard No. 35).

E. Solid Polymer products: Color/pattern/material selected by Architect in thickness as specified. Solid Polymers and adhesives must be N.S.F. approved (Standard No. 51).

F. Casters:

1. Fabricated fixtures with "Open Base" construction: Jarvis and Jarvis Model No. 5-405-113P-NSF swivel casters with grease seals on forks and wheels; Zerk fitting in swivel; two casters: Model No. E-75 Verti-Lock brakes. All casters: B-7" rolling bumpers with stainless steel top discs.

G. Cutting Boards: 1/2" thick Read Products, Inc. "Richlite" cutting board, size as indicated.

H. Identification Plates, Labels, Tags:

1. Prohibited Information: Names of suppliers, fabricators, and contractors.

2. NSF Labels: Required on all pieces of equipment.

3. Required Information: Function or purpose of controls such as display light switches, food warmer controls, etc.

4. Plate Construction: Engraved phenolic plastic, secured to equipment with epoxy cement or stainless-steel screws. Furnish samples.

2.2 PLUMBING / MECHANICAL REQUIREMENTS

A. Plumbing Fittings and Components: Furnished under this Section as follows:

Note: Fitting and components described in Items 1, 2, 3, 4, and 5 are furnished loose by 11 40 00 for final installation and connection by Division 22.

1. Control valves and appliance pressure regulators for water, gas, steam, and vacuum breakers: wherever required on food service equipment (chrome-plated where exposed).

2. Faucets and drains with and without connected overflows (unless otherwise indicated) for all sinks.

3. Specialty food service water-fill faucets, hose bibbs, or hose assemblies indicated in drawings/specifications.

4. Wade Model No. W-10 Shock-Stop shock absorbers for all food service equipment with quick-opening or solenoid-operated water valves.

5. Dormont Series Water Quick Disconnect hose, diameter per water connection size requirements, with safety fitting, w/coiled restraining device, full port ball valve, antimicrobial coating, lifetime warranty.

6. Extensions of indirect waste fittings to open-sight floor sink or floor drains from sinks, under bar equipment, and food-holding components of serving counters (e.g., cold pans, hot food wells, refrigerator/freezer coils not equipped with condensate evaporators) furnished and installed by Division 22. Drains: All drains to be type 'K' Copper – Paint with aluminum paint where exposed**. Div. 22 to ensure a minimum air gap of 1" and not less than twice the effective opening of the indirect waste pipe, per code. Div. 22 to ensure all drain lines are centered over floor sink grate openings and no water splashes on the floor.**

7. Piping brackets and supports beneath fabricated equipment.

8. Closed Base Bodies: Removable 18-gauge stainless steel closure panel at plumbing penetrations under the top.

9. Control valves on Open Base fixtures: Mounted on a 14-gauge stainless steel gusset-shaped panel with h 3½" setback from the countertop edge/rim to the face of the control handle.

10. Fill hose/faucet at support pedestals or Closed Base Body: Installed in a 15" x 18" x 5" deep recessed mounting panel. Panel bottom: sloped on a 60° angle, with 3/8" stainless steel rod hanger-bracket for the hose.

11. Provide filtration option as shown on contract documents (a, b, c, or combination thereof):

    a. Water Filter System:

        i. In-line System: Everpure System filters for coffee/tea brewers, water chillers, and beverage systems. They should be sized per the manufacturer's recommendation.

        ii. Combi Ovens, Convection Steamers, and Ice Maker Filter Systems: **Provided by manufacturer as required.**

    b. Remote Central Water Filter System.

    c. Remote and/or In-line Reverse Osmosis system.

B. Gas-Heated Equipment Fittings and Components: Furnished under this Section as follows:

1. Fixed Equipment: Dormont 1675KIT2S48 gas appliance connector: Diameter per fuel volume/connection size requirements. Gas valve diameter size per fuel volume/connection size requirements.

    a. Restraining device: Heavy duty steel cable, fastened to equipment and walls, 3" to 6" shorter than equipment connector length.

C. Final Plumbing Connections Provisions:

1. Fabricated equipment containing components, fittings, and devices indicated on food service connection drawings to be connected to the building systems: each component, fitting, or group thereof pre-piped to a utility compartment for final connection by Division 22. Refer to drawings for capacities.

2. Field-assembled equipment (e.g., prefabricated walk-in assemblies, exhaust hoods, ware wash machines, convection ovens, etc.): plumbing components completely interconnected under this Section for final connection arrangements indicated on Utility Connection Drawings.

3. All plumbing final connection points of equipment shall be tagged, indicating the following:

   a. Item number

   b. Name of devices or components

   c. Type of utility (water, gas, steam, drain, chilled water)

D. Ducts and Vents:

1. Exhaust hoods furred-in to ceiling: 2” high duct collar for final connection to the duct system.

2. Warewash machines equipped with integral vent cowls or extended hoods: furnished with 18-gauge stainless steel seamless duct risers to 6” above the finished ceiling for final connection. The duct: trimmed at the ceiling with a 16-gauge stainless steel angle flange with all corners welded.

E. Refer to Section 1.4: OTHER DIVISIONS/CONTRACTORS RELATED WORK; Sub Sections E. Plumbing and F. Mechanical for additional information.

2.3 FOOD SERVICE EQUIPMENT REFRIGERATION SYSTEMS

A. Install complete with all refrigerants, oil, dials, dehydrators, gauges, and controls required for the system’s proper operation.

B. Self-contained or factory-installed compressors: Check and adjust to the proper operating temperature prescribed by FDA/HACCP.

2.4 PLUMBING TRIM

A. Faucets: Furnished for all sinks or equipment requiring open water supply.

B. Fill Faucets: Furnished for appliances requiring open water supply.

C. Drain Fittings: Furnished for all sinks or equipment requiring removal of liquids. Install specified chrome-plated or stainless-steel fittings in die-stamped openings with washers and locknuts. The solder may be used as a sealer but shall not be applied to the top surface of the drain fittings.

2.5 ELECTRICAL REQUIREMENTS

A. All electrical systems, components, and accessories within the work of this Section: Certified to be in accordance with NEC 70.

B. Electrical Fittings and Components: Furnished under this Section as follows. Coordinate food service equipment loads, voltage, and phase with the building system and confirm any existing or OF/OI equipment requirements.

C. Cord and Caps:

1. Coordinate all food service equipment cord/caps with related receptacles.

2. All 120, 120/208, and 208 volts “plug-in” equipment shall have Type SO or SJO cord and plug with ground wire fastened to the frame/body of the item.

3. Cord lengths for fixed equipment: Adjusted to eliminate loose-hanging excess.

4. All non-fixed plug-in “buy-out” equipment: Hubbell configuration and ratings as required.

5. All mobile electrical support equipment (heated cabinets, dish carts, etc.) and counter appliances mounted on mobile stands (mixers, food cutters, toasters, coffee makers, microwave ovens, etc.): 8’-0” cord length with cord-hanger strap secured to the rear of equipment or mobile stand.

D. Switches and Controls:

1. Each motor-driven appliance or electrically heated unit: Equipped with a control switch or starter per Underwriters’ Laboratories, Inc., with low-voltage and overload protection.

2. Disposer controls recess-mounted in the wall: External fittings and accessories removed from the enclosure and furnished with 12-gauge stainless steel perimeter angle flange with welded corners. Install control at 4’-0” AFF to the bottom of the enclosure.

3. Disposer controls recess-mounted in counter-splash risers: External fittings and accessories removed from NEMA 4 enclosure and furnished with 12-gauge stainless steel perimeter angle flange with welded corners. Install control at 3’-0” AFF to the bottom of the enclosure. Provide the panel with a 60” long Seal-Tite electrical conduit from the bottom of the control panel for final field connections under Division 26.

4. Equipment that is not provided with built-in circuit breakers or fused terminal block and is indicated on Utility Connections Drawings to be directly connected to the building electrical system: a NEMA 4 stainless steel disconnect switch furnished and installed by Division 26.

5. All remote manual starters, disconnect switches, magnetic contactors or starters, and push-button stations: NEMA Type 4 enclosure; NEMA Type 1 enclosure only when installed in a Closed Base Body.

E. Heating Elements:

1. Electrically heated equipment: Thermostatic controls.

2. Water heating equipment: Equipped with positive low water shut-off.

F. Receptacles and Switches:

1. Receptacles installed in vertical panels of support pedestals or Closed Base Bodies: installed in 12” x 8½” x 3” deep recessed mounting panel sloped at a 60° angle and turned up to the top of the opening.

2. Pre-wire receptacles in closed base fixtures to a junction box installed within 6” from the bottom of utility or compressor compartments.

3. Receptacles mounted on Open Base fixtures: Installed on a 12” x 10½” x 4½” deep 14-gauge stainless steel panel with returned ends and sloping recess—secure panel to the underframe of fixture top.

4. Pre-wire receptacles on open base fixtures to a junction box secured to a leg or mounted on the underside of the lower shelf. Vertical runs of wiring: Made in rigid conduit or within the tubular leg.

5. Receptacles installed in/on-fabricated equipment: Hubbell, Inc. assemblies horizontally mounted in a metal box with stainless steel cover plate.

6. Switches installed in/on-fabricated equipment: Hubbell, Inc. with metal box and stainless-steel cover plate. Switches: pre-wired to the controlled device and a junction box installed within 6" from the bottom of the utility or compressor compartment. All refrigeration system switches: Installed within the compressor compartment near the door opening.

7. Load centers installed in/on fabricated equipment to have all fixture components pre-wired to the load center with balanced phase loading. Load center: Ready for final connection by Division 26 and flush-mounted within the utility compartment rear panel, set back 8" from the access door. All breaker/device information will be typewritten on the circuit schedule in the load center door (number corresponding breaker/device) with an enclosed schematic wiring diagram of fixture components.

8. All receptacles are to be pre-wired to the cord and plug assembly and routed through the over-shelf post at all island equipment locations unless specified otherwise.

G. Light Fixtures:

1. Light fixtures with lamps installed in/on fabricated or field-assembled equipment: pre-wired to a junction box for final connection (continuous-run fixtures when indicated).

2. LED Display Light: Install light fixtures full-length of Display Stand and Serving Shelf with stud bolts and pre-wire through support posts to an apron-mounted switch.

3. Heat Lamps: Installed to the underside of serving shelf assemblies. When multiple 24" heat lamps are specified, provide maximum length heat lamp chassis. Install all switches remotely from lamps.

4. **Walk-in assembly LED Light Fixtures: Furnished by Section 11 40 00, final installation by Div. 26. All electrical wiring and conduit, provided by Div. 26, electrically connected through the Vapor Proof light fixture base connection, located on the interior door header—all Conduit to be Seal-tight conduit. Door frame wiring stubs out the top of panels 8" in flexible conduit for final connection by the electrical contractor. All horizontal conduits: below ceiling panels. All lighting fixtures will be wired from inside the assembly—no penetrations through the ceiling panels. Seal-sleeved penetrations are airtight at both sides of the panel. KEC is responsible for verifying that trade contractors seal all penetrations.**

H. Final Electrical Connection Provisions:

1. Fabricated equipment containing electrically operated components or fittings indicated on Utility Connections Drawings: Direct connected, with each component, fitting, or group pre-wired to a junction box for final connection by Division 26. Refer to drawings for circuit loading.

2. Fabricated equipment containing electrically operated components and devices indicated: Circuit-breaker load center with each component or device pre-wired to a

separate circuit breaker for balanced phase loading and single final connection by Division 26.

3. Field-assembled equipment (e.g., prefabricated walk-in assemblies, exhaust hoods, ware wash machines, etc.) shall have electrical components completely interconnected in this Section for final connection arrangements as indicated on Utility Connection Drawings by Division 26.

4. Pre-wire the following groups of walk-in assembly electrical devices to a top-mounted junction box for final connection by Division 26 per compartment grouping (unless otherwise indicated).

a. Light fixtures and switches; heated pressure-relief ports.

b. Door/jamb heaters.

c. Evaporator fans, defrost elements and drain line heaters.

5. All electrical final connection points of equipment shall be tagged, indicating the following:

a. Item number.

b. Name of devices on the circuit.

c. Total electrical load.

d. Voltage and phase.

I. Lamps: in all food service equipment containing light fixtures. Refrigerator or heated cabinets: All exposed LED lamps above or within a food zone: Shat-R-Shield lamps or standard lamps, sleeved with end caps.

J. Refer to Section 1.4: OTHER DIVISIONS/CONTRACTORS RELATED WORK; Subsection F. Division 26 (Electrical) for additional information.

2.6 CUSTOM – FABRICATED / ASSEMBLED UNITS

A. Mechanical or electrical operating components or products integrated into a fabricated fixture: Ventilation and service access required or recommended by the manufacturer. The size and placement of the service access panel(s) permit easy lubrication, adjustment, or replacement of all moving parts and are to be indicated on fabrication shop drawings.

2.7 BAKER TABLETOPS (Unless specified otherwise)

A. 14-gauge 304 S/S top with 2” square turn down at the front, 6” high enclosed splash at two (2) sides and rear. Brace same as “Counter/Tabletops.”

B. 1¼” x 6” high integral coved riser at rear and ends unless indicated otherwise on drawings.

C. 16-gauge stainless steel flour-trough at free long sides, secured to the underside of the top. Trough: 3” diameter with eased edges/corners.

2.8 COUNTER / TABLETOPS

A. 14-gauge stainless steel; all free edges turned down 2” with ¾” tight hem at the bottom—free corners: rounded on ¾” radius.

B. Marine edges: Turned up ½” on 45º angle and turned down 2” with ¾” tight hem at the bottom.

C. Cafeteria serving countertops at hot food stations: Full-length x 3½” x ½” high raised rail at (customer’s) front side with 45º integral turndown to counter surface.

D. Tops abutting high fixtures or walls: Cove up specified height and slope back 1½” at the top on 45º angle; 2½” slope where piping occurs. Turn down 1” at the rear of the splash and tight ends to the bottom of the top turndown. Secure splash turndown to the wall with a 4” long 14-gauge stainless steel “Z” clip anchored to the wall, 36” OC.

E. Freestanding tables and all serving counter splash-risers: Turned back at a 90º angle with 1” turndown at the rear.

F. Brace tops with rigid-welded 1½” x 1½” x 1/8” galvanized steel angle frame at the perimeter with cross bracing 2’-0” OC maximum. Provide 4” x 4” x 12-gauge stainless steel triangular pads where leg gusset welds to frame. Paint the entire frame with Rust-Oleum gray semi-gloss enamel. Angle frames: Secured to the underside of top surfaces with ¼” studs welded 9” OC maximum with chrome-plated washer, lock washer, and cap nut. Studs: Such length that cap nuts can be made up tight, bringing the top down snugly on the angle frame, eliminating all vibrations or “oil-canning.”

G. Tops: 1½” overhang at free sides of underframe or Closed Base Body.

H. Mockett Model No. SG5-26 chrome-plated/plastic grommet assembly or integrally welded stainless-steel flange or inverted gusset where service utilities or support posts penetrate or abut tops, ground, and polished to match the top. When conditions permit, provide a 1” x 1½” rectangular backsplash opening for service utilities instead of piercing the horizontal surface. Install stainless steel split tubing at the raw edge of the opening.

I. Extend underbracing members to the wall, turn down 6”, and anchor to the wall when specified to be mounted on leg/bracket assembly.

J. All openings in tops: 3/16” high raised die-formed edges.

K. All top openings for pans or inserts: 20-gauge stainless steel, watertight liners, 8½” deep, secured to the underside of the countertop.

L. All “built-in” and “drop-in” counter equipment/appliances to have framing members at the perimeter of the opening.

M. Scrap Basket: 18-gauge stainless steel construction 6½” x 6½” x 21¾” long. Top of container: 5/8” wide x ¼” high full perimeter flange with ¼” diameter stainless steel rod bail handle. Interior vertical corners coved on ½” radius. Countertop: Fitted with 6¾” square die-stamped opening.

2.9 COLD PANS

A. 14-gauge stainless steel with ¾” coved interior welded integrally to the countertop with a 3/16” raised edge at the perimeter of the opening – depth of cold pan to follow NSF 7 compliance.

B. Slope bottom to required quantity of Component Hardware Model No. E16-4021 drain fittings at 48” OC maximum. Sleeve through insulation at drain fittings and extend common drain line into utility compartment for indirect waste connection.

C. ½” OD copper refrigerant lines in a serpentine pattern, 1½” OC flattened for maximum contact. Secure tubing to the underside of ¼” thick aluminum “distribution plate” installed tight to the underside of the frost plate area and apply cold-conductive mastic to all surfaces.

D. Component Hardware Model No. E16-4021 drain fittings at 48” OC maximum, sleeved through the insulation with common drain line extended into utility compartment.

E. Heat Cable: Low-wattage, full-perimeter, below countertop at the edge of depression. Secure with “Z” clips, 9” OC, and interwire with compressor switch for simultaneous operation.

F. Enclose the sides and bottom of pans with an airtight 18-gauge galvanized jacket and pack with 2” fiberglass insulation set in mastic.

G. Compressor: Size as indicated or required to accommodate the size of the cold pan. Locate the compressor in the compartment below the unit or as shown on the drawings.

H. Sectional 16-gauge stainless steel perforated false bottom (¼” holes, @ ¾” OC). Turn down 1½” on all sides, weld corners, and provide finger rings. False bottom sections: 24” long maximum.

2.10 DRAWERS

A. Stainless Steel Liners: Component Hardware Model No. S81-2020C (20” x 20”), easily removable with drawer in the fully extended position.

B. Drawer Frame: 16-gauge stainless steel flanged out at the top. Weld the frame to a double-panel 16-gauge stainless steel drawer front with full-length recessed pull at the top (similar profile as Garcy Model No. R-1060) with closed ends.

C. Channel-formed horizontal pull: ¾” turndown at the front and ends with ½” tight hem. The front edge of the pull: flush with the face of the drawer. Recess behind pull: sloped up on a 60° angle, terminating 1” below the bottom edge of pull.

D. Mount drawer frame on Component Hardware Model No. S52-2020 self-closing slides, with Delrin bearings, full-depth of the fixture. Secure slides to the body or brackets to eliminate lateral movement in the extended position. Refrigerator drawers: Component Hardware Model No. S52-2024 stainless steel slides with Delrin bearings.

E. Drawer enclosure in an Open Base Fixture: 18-gauge stainless steel flanged out at the top for attachment to the underside of the tabletop. The lower edge of the enclosure is flanged in toward the open bottom. Mount drawer slides to enclosure and brace as required. The face of the enclosure is to be the same length and height of the drawer face. Provide ¾” deep offset in front of the enclosure and 2½” from the underside of the tabletop for a flush-fitting appearance.

F. Drawer enclosure on freestanding fixture: Full depth of table framing.

G. Drawer enclosure in a Closed Base Fixture: Completely partitioned from the adjoining area. Drawer front: Flush fitting with the face of the body.

H. Drawer Liners other than tool/utility: **Bread Drawer:** S/S liner sized to fit drawer; **Refrigerated Drawer:** S/S liner sized to fit drawer.

I. Cash Drawer: Integral stainless-steel body, 3” deep.

2.11 FOOD WELLS (UNLESS SPECIFIED OTHERWISE)

A. Food Warmer Controls: Remote-mounted in sloping recessed apron panel. The control panel is recessed 2½” from the bodyline at the top of the 60° slope and 1” at the lower edge. Terminate slope angle 2½” below the countertop. Mount panel on concealed piano hinge at bottom edge; secure with screws at upper corners.

B. Manifold all warmer drains and extend to within the utility compartment for indirect waste connection. Install valve in the drain line and extend handle through compartment door.

C. Removable 18-gauge stainless steel closure panel at the underside of warmers.

D. 14-gauge stainless steel plate/utensil shelf full-length of hot food station unless noted otherwise: 10” below countertop x 9” deep, with rear panel coved up to the underside of the countertop; end panels turned up square. Front of shelf: Turned down 1½” and returned under for closure panel attachment.

E. Food wells: Hatco Model No. HWBIBRT-FULD insulated food warmer (1200 watts, 208 volts, single phase) secured to the underside of 12” x 20” die-stamped countertop openings with thermal breaker mastic rope applied at the perimeter of food well flange.

F. Soup Warmers: Hatco Model No. HWB-11QTD soup warmer secured to the underside of 11” diameter die stamped countertop opening with thermal breaker mastic rope applied at the perimeter of soup well flange. The maximum allowable temperature of the countertop at the contact surface is: 120°F. Each warmer: Equipped with one 11-quart stainless steel round insert and slotted cover.

2.12 SINKS

A. 14-gauge stainless steel; all interior corners (horizontal/vertical) coved on ¾” radius. 1½” wide double-walled partitions with flat tops between compartments.

B. Continuous exterior panels of multiple-compartment sinks: 14-gauge stainless steel filler panel welded, ground, and polished between compartments.

C. Sinks (with overflow): Score and slope sink bottom ½” to die-stamped opening fitted with Fisher 22306 twist waste valve 3 1/2” x 2” with overflow and tailpiece. 18-gauge stainless steel bracket: Welded to sink bottom for drain stem with 1½” handle clearance.

D. Where sinks are installed in fixtures with Closed Base Body, provide a Fisher 22306 twist waste valve 3 1/2” x 2” with overflow and tailpiece. (Sinks with dimensions larger than 20” x 20” in Closed Base Body will not have overflow fitting.) 18-gauge stainless steel bracket: welded to sink bottom with T & S Model No. BL-4740-1 guide bushing. Install on shortened drain stem, one T & S Model No. BL-4710-1 remote control stem assembly only (length as required) with Model No. 113-L universal joint and white blank button. Set drain control handle in Cambro Model PSB-6 bowl with bottom omitted (dress raw edge) to permit passage of drain handle—secure bowl in utility compartment door or body panel with clear silicone.

E. When single-hole deck-mounted faucets are specified, install overflow fitting in the sidewall of the sink compartment and provide ell-fitting in connecting tubing.

F. Flush Covers when specified: 1/2” thick Read Products, Inc. “Richlite” cutting board with two (2) finger holes, size as indicated. Support clips: ¼” stainless steel rod 2” long, formed at 45º

with two ¾" leg ends (¼" long threaded ends). Insert rod clips through tight-clearance holes in the sink, seal watertight, and secure with stainless steel acorn nuts or tack-weld at the exterior of the sink wall. Set support clips ½" below the top. Provide a 14-gauge stainless steel channel or angle support frame to store covers when not in use. Cover holder: Adjacent to sink compartment, below countertop, or under drawer assembly.

G. Manifold drain lines together for all multi-compartment sinks (two-compartment, three-compartment, etc.).

2.13 TRAY SLIDES (UNLESS OTHERWISE SPECIFIED)

A. Tray slides: 12" wide, solid 14-gauge stainless steel turned up 2" at the rear behind countertop turndown; turned down 4" at the front and free ends unless otherwise indicated.

B. Three ¼" high die-formed inverted "V" ridges at 4" OC, 2" from the leading edge, terminating 2" from ends of tray slide with tapered ridge ends.

C. Ridges formed on radius: Equal-length segments with 2" separation between chords.

D. Secure tray slides to countertop/body frame, same as "Countertops." Enclose the exposed underside of the tray slide with 18-gauge stainless steel.

E. When indicated, project tray slides 2" beyond the serving countertop and return the entire width of the serving counter at free ends.

F. All tray slides are to be provided and mounted per ADA requirements.

2.14 DISHTABLES

A. Soiled/clean dishtable: 14-gauge stainless steel; free edges coved up 3" with 1½" diameter rolled rim and bullnose corners.

B. Edge of dishtables next to high fixtures or walls: Coved up 10" and sloped back 1½" on 45º angle; 2½" slope where piping occurs. Turn down 1" at the rear of splash and secure to wall with 4" long 14-gauge stainless steel "Z" clips anchored to the wall, @ 36" OC.

C. Exposed rear splash: 16-gauge stainless steel finish panel from the top of the splash to the bottom edge of the rolled rim with a welded vertical joint at the end. Secure the panel with concealed attachment and install bracing 24" OC.

D. Cove all interior corners (horizontal/vertical) on ¾" radius and slope tables 1/8" per foot to sinks, scuppers, or ware wash machines, maintaining level crown/splash.

E. Brace dishtables with 1" x 4" 12-gauge stainless steel channels down the top centerline and between each pair of legs, with closed ends. Bracing: secured to the underside of the dishtable with ¼" studs welded 6" OC maximum, with chrome-plated washer, lock washer, and cap nut. Studs: such length that the cap nuts can be made up tight, bringing the dishtable down on the channel members, eliminating all vibration and "oil-canning."

F. Integrally welded stainless steel flange or inverted gusset where service utilities or support posts penetrate or abut tops; ground and polished to match the top.

G. Hose Bibb: Chicago Model No. 305VBRCF; mounted on 12-gauge stainless steel flange or inverted gusset bracket with 3/8" stainless steel rod hose hanger.

H. Extend underbracing members to the wall, turn down 6”, and anchor to the wall when specified to be mounted on leg/bracket assembly.

I. Paper-Drop Opening: 9” square with 4” integral chute having hemmed bottom edge. Slope dishtable top 1” toward the opening, forming a 16” square tapered deposit point.

J. Accessible Tray-Drop Opening: 10” x 18” with integral 16-gauge stainless steel seamless chute sloped at 45º angle toward the center of mobile soak sink position.

K. All dishtables with a conveyor-type Type Dishmachine must have a table limit switch provided by Manufacturer and installed by Division 26. Prepare clean dishtable with holes for table limit switch and provide s/s back cover. Wiring must be concealed within dishtable fabrication.

2.15 DISH / TRAY DEPOSIT ASSEMBLY

A. 14-gauge stainless steel deposit shelf, size as indicated. Extend the frame through the opening, flush with the public side of the partition, height as local code authorities require. Turn the shelf down 1” at the front with ¾” return at the bottom (either scribed into a partition or forming reveal). Shelf: 1” square turndown at the long rear side, integral with conveyor slider pan, tray-accumulator, or dishtable. Extend the rear/end splash to align with the head of the deposit station opening. Modify rolled rim at the operator’s side of the tray drop window to have a 3” rolled rim.

B. 18-gauge stainless steel window frame with perimeter flange channel-formed 1” x ¾” at both wall sides. Weld all corners of the frame and install with concealed attachment. Align/abut one jamb of the frame with end splash of conveyor slider pan or dishtable whenever adjacent.

2.16 UTENSIL – WASH COUNTERS

A. 14-gauge stainless steel; all free edges coved up 3” with 1½” diameter rolled rim and bullnose corners.

B. Edges of utensil-wash counters next to high fixtures or walls: Coved up 10” and sloped back 1½” on 45º angle; 2½” slope where piping occurs. Turn down 1” at the rear of splash and secure backsplash to the wall with 4” long 14-gauge stainless steel “Z” clip anchored to wall @ 36” OC. Vacuum breaker pockets: 4” long square turnback sections aligned with the slope break line.

C. Exposed Rear Splash: 16-gauge stainless steel finished panel from the top of the splash to the bottom edge of the rolled rim with a welded vertical joint at the end of the splash and ½” turnback at the bottom of the panel. Secure the panel with concealed attachment and install bracing 24” OC.

D. Cove all interior corners (horizontal/vertical) on ¾” radius and slope tables 1/8” per foot, maintaining level crown.

E. Brace utensil-wash counters with 1” x 4” 12-gauge stainless steel channels down the centerline of the top and between each pair of legs, with closed ends. Bracing: Secured to underside of dishtable with ¼” studs welded 6” OC. maximum, with a chrome-plated washer, lock washer, and cap nut. Studs: Such length that the cap nuts can be made up tight, bringing the dishtable down on the channel members, eliminating all vibration and “oil-canning.”

F. Integrally welded stainless steel flange or inverted gusset where service utilities or support posts penetrate or abut tops: ground and polished to match the top.

G. Extend underbracing members to the wall, turn down 6”, and anchor to the wall when specified to be mounted on a leg/bracket assembly.

H. Hose Bibb: Chicago Model No. 305VBRCF; mounted on 12-gauge stainless steel flange or inverted gusset bracket with 3/8” stainless steel rod hose hanger.

2.17 DOORS

A. 18-gauge x 1” stainless steel double pan-formed welded construction, insulated with 1” thick polyurethane boards. Seal the perimeter joint of the pans. Offset the lower horizontal framing member of the Closed Base Body to align the flush access door with the bottom of the Body.

B. Channel-formed full-length horizontal recessed pull: ¾” turndown at the front and ends with ½” tight hem. The front edge of the pull: Flush with the face of the door. Recess behind pull: Sloped up on a 60° angle and terminated 1” below the bottom edge of pull.

C. Door Hardware

1. Two Component Hardware Model No. M75-1002 stainless steel hinges (notch door/jamb at hinge location).

2. Component Hardware Model No. 35-2000 Concealed Magnetic Catch.

3. Component Hardware Model No. D30-4780 lock in the upper free corner of the door.

D. Louvered opening: Cut out opening size as indicated, turn in 1”, and weld. All corners: Ground and polished.

1. Full-height 18-gauge stainless steel louver with 1” vanes at 45º, ½” spacing. Perimeter channel-formed frame: 1½” x 1”.

2. 45º x 1” x ½” x opening width plus ½” 18-gauge stainless steel louver.

3. Tack the louver flange's weld tab to the door's back panel.

E. Drain handles opening: 6” diameter hole through the double pan to accommodate Cambro Model No. PSB-6 Bowl:

1. Secure the bowl to the door panel with clear silicone.

2. Omit the bottom of the bowl. Dress raw edges of opening for passage of drain handle.

3. Exposed insulation at the penetration of the door pan: Painted black.

F. Sliding Doors: fabricate same as Paragraph “A.”

1. Aluminum Sliding Door Track: Component Hardware Model No. B57-0000 Series, length as required. Secure to angle frame at the top of the underside.

2. Front/rear door sheaves: Stainless steel ¾” side-mounted door hangers; two (2) required per door.

3. Recessed Vertical Pull at Upper Corner of Door: Component Hardware Model No. P63-1012.

4. By-Passing Door Guides secured to bottom shelf: Component Hardware Model No. B62-1093.

5. Door Stop at the bottom edge of door: Component Hardware Model No. B60-1086.

G. Offset the lower horizontal framing member of the Closed Base Body/utility compressor compartment to align the door flush with the bottom of the Body.

2.18 CLOSED BASE BODIES

A. Frame: Rigid-welded 1½" x 1½" x 1/8" galvanized steel angle forming a continuous structure around the top and bottom perimeters of the fixture, a post at each corner, studs spaced 48" OC maximum. The top of the frame is cross-braced with 1½" angles, 2'-0" OC maximum.

B. 18-gauge stainless steel panels and trim with concealed attachment. All seams: Welded, ground, and polished.

C. Exposed Vertical Corners: Rounded on ¾" radius. Closed Base Bodies adjacent to walls or fixtures: square corners.

D. Vertical and horizontal channel members at shelf interior or drawer enclosures, such as corners and center mullions: Closed and sealed.

E. Closed Base Bodies set on finished masonry platforms: closed and caulked at the underside of equipment overhang and bolted to the platform. Body overhang of the platform: 1" at free ends and 2" at the front and exposed rear sides.

F. Closed Base Bodies not set on the platform: Component Hardware Model No. A54-2-6, 6" legs spaced 4'-0" OC maximum.

2.19 COMPRESSOR COMPARTMENTS

A. Same material as Closed Base Bodies with back and end partitions; omit bottoms only.

B. 10-gauge steel slide-out support: Channel frame on full extension slides with 125 lb. minimum capacity secured to fixture frame with anti-vibration mountings for maximum sound deadening. Closed Base Body on the solid platform: front-to-back slide-out support channels set 4" above the bottom for air circulation.

C. Access Door: 18-gauge stainless steel double-pan type with a channel formed horizontal recessed pull full length of the top (similar profile as Garcy Model No. R-1060) with closed ends. Channel-formed horizontal pull: ¾" turndown at front and face of the door. Recess behind pull slopes up on a 60° angle, terminating 1" below the bottom edge of pull. Offset the lower horizontal framing member of the Closed Base Body to align the flush access door with the bottom of the body. Door hardware: two Component Hardware Model No. M75-1002 stainless steel hinges (notch door/jamb at hinge locations) and Component Hardware Model No. 35-2000 concealed magnetic catch.

D. Access Doors Louver: Full-height, with 1½" x 1" x 18-gauge stainless steel channel-formed frame with welded corners. 18-gauge stainless steel louver. Submit a sample of the design for approval.

2.20 UTILITY COMPARTMENTS

A. Closed Base Bodies or Pedestal Supports: Fitted with utility compartments wherever piping or wiring is required in/on the fixture.

B. Same material as Closed Base Bodies with full-height back and end partitions. Omit bottoms except at hose-reel locations.

C. Access Doors: 18-gauge stainless steel double-pan type with a channel formed horizontal recessed pull full-length of the top (similar profile to Garcy Model No. R-1060) with closed ends. Channel-formed horizontal pull: ¾" turn down at the front of the door, a recess behind the pull slopes up on a 60° angle, terminating 1" below the bottom edge of the pull. Offset the lower horizontal framing member of the Closed Base Fixture to permit flush alignment of the door with the face and bottom edge of the body. Door hardware: two (2) Component Hardware Model No. M75-1002 stainless steel hinges (notch door/jamb at hinge locations) and one Component Hardware Model No. 35-2000 concealed magnetic catch.

D. No shelves of Closed Base Fixtures are to be penetrated.

2.21 UTENSIL RACKS

A. Rack: ¼" x 2" 300 series stainless steel flat bar with No. 4 finish, fully welded and formed to match the shape shown on drawings. Lowest band - 7'-6" AFF unless otherwise indicated.

B. Ceiling Mount Supports 1-5/8" diameter 16-gauge stainless steel tubing from band to 18" above the ceiling. Anti-sway bracing above the ceiling - 1½" Unistrut members. Tubing penetrations at the ceiling - Component Hardware Model No. A16-0206 stainless steel gussets.

C. Table Mount Supports 1-5/8" diameter 16-gauge stainless steel tubing extended through countertop. Secure to closed base framing or cross rail/undershelf on the open base fixture. Tubing penetrations of countertops - integrally welded stainless steel inverted gusset.

D. Utensil Rack Hooks - Component Hardware Model No. J77-4401 stainless steel hooks spaced 8" OC maximum.

E. Electrical Receptacle: NEMA No. 5-20-R or as noted. Mount in fully welded 3½" x 5½" x 3" 14-gauge stainless steel enclosure with ½" radius corners. Stainless steel cover plate to fit specified receptacle. Pre-wire through tubular support for final connection above the ceiling by Division 26.

2.22 CASHIER / SERVING COUNTERS

A. Exterior Body Panels, when specified: ¾" thick marine grade hardwood plywood with plastic laminate or solid polymer in Architect's selection of color/pattern at all exposed surfaces; backing sheet where concealed.

B. Position, size, and finish horizontal or vertical reveal as Architect directs.

C. Secure panels to counter body framing in a concealed manner. Install removable panels with "Z" clips overlapping body framing members.

D. Hinged doors in exterior body panel(s) - Grass Model No. 1200VZ or 1200VZ8 self-closing hinges. Three (3) required per door; Grass Model No. G/HRZ base plate at each hinge; Ives Model No. TM820 concealed push latch at each door. Confirm Model No. and provide samples with the submittal.

E. Cashier counter to have 16-gauge s/s intermediate shelf, turned down 1 1/2" with tight hem at front. Cove up 2" at rear and sides. Brace undershelf with 1" x 4" 14-gauge stainless steel

channel at the longitudinal centerline. Provide an outlet for power/data within the body above the intermediate shelf. Provide cash drawer inserts per district standards.

F. Sneeze Guards to be adjustable and meet NSF standards.

2.23 OPEN BASE STRUCTURES

A. 1-5/8" OD x 16-gauge seamless stainless-steel tubing legs bevelled at the bottom. 1¼" OD cross rails fully welded (360° smooth and polished) to legs at 10" AFF, OC.

B. Top of Leg: Inserted in Component Hardware Model No. A20-0206 gusset fully welded to table frame or sink bottom.

C. Bullet Foot: Component Hardware Model No. A10-0851.

D. Freestanding fixtures requiring utility connections: Component Hardware Model No. A10-0854 flanged feet at the fixture corners, anchored to the floor with non-corrosive bolts.

E. Table Bases: Maximum leg spacing of 6'-0" OC; dishtable and utensil wash counter bases at 5'-0" OC.

F. Open Base equipment specified to be supported by brackets at the rear side only (not completely cantilevered): Tubular legs at the front side only with Component Hardware Model No. A10-0854 flanged feet anchored to the floor with non-corrosive bolts. Front-to-back cross rail: fitted into Component Hardware Model No. A20-0406 circular gusset secured to the wall with non-corrosive bolts.

2.24 UNDER SHELVES

A. Open Base Structures: 16-gauge stainless steel turned down 1½" with tight hem at the bottom. Notch all corners to fit tubular legs and weld from the underside to fill the gap, grind, and polish. Cove up 2" at the rear or ends adjacent to wall, columns, refrigerators, etc. The turn-up at freestanding fixtures is to be hemmed tight to the bottom of the turndown. Brace undershelf with 1" x 4" 14-gauge stainless steel channel at the longitudinal centerline and each intermediate pair of legs.

B. Open Base Structure specified to be supported by brackets at the rear side only (not completely cantilevered): 16-gauge stainless steel turned down 1 ½" at free sides with tight hem at the bottom edge. Notch all corners to fit tubular legs as required and weld from the underside to fill the gap, grind, and polish. Cove up 2" at rear ends, as indicated. Fill the gap at the front-to-back rail, grind, and polish. Brace undershelf with 1" x 4" x 1" 14-gauge stainless steel channel at longitudinal centerline between front to back rails.

C. Closed Base Fixtures: 16-gauge stainless steel turned down 1½" at front. Front edge of bottom shelf: Turned back and sealed to finished masonry platform or boxed for leg application. Center shelf has ¾" tight hem.

1. Shelves: Turn up square at ends (coved up at rear only) to the shelf above or countertop flanged out for attachment with no open spaces at interior.

2. All shelf partitions at exposed ends of cabinet bodies or interiors: Free of exposed framing members.

3. Reinforce shelves with full-length 1" x 4" x 14-gauge stainless steel closed hat channel.

4. Unless otherwise noted, all closed base undershelves must be 22” deep and clear.

5. Fully weld smooth and polish the vertical seam of the shelf turndown/turn up with the face of the body partition.

6. Seal the vertical seam of the square turn-in at the exposed interior of open shelf sections.

2.25 ANCHOR PLATES / WOOD GROUNDS

A. Behind the finished surface, wherever building walls, partitions, or ceiling construction will not accommodate direct attachment of equipment such as over shelves, wall cabinets, hose reels, utensil racks, exhaust hoods, display cases, etc. Material and installation by General Contractor. Location and coordination with trades by Section 11 40 00.

B. Anchor Plates: Not less than 12” x 12” x ¼” thick steel, secured to the structure above or behind the finished surface, positioned at attachment points.

C. Wood Grounds: Length required by fixture, component, or device, 24” wide x ¾” thick plywood secured to partition system before gypsum board installation.

D. Above ceiling supports: Structural shapes (4” x 8.0 lb. channel) suspended from the structure. Maximum height 15’-0” AFF. Size: width of equipment x length of equipment plus 6’-0”. Cross bracing at 6’-0” OC maximum.

2.26 OVER SHELVES

A. 16-gauge stainless steel with free edges turned down 1” with ½” tight hem at the bottom—¾” radius at free corners.

B. Turn up 2” raw at walls and sides with a horizontal coved corner at the rear. Round front corners of turn up on ¾” radius.

C. Where shelf width exceeds 12” width, reinforce with ½” x 4” x 14-gauge stainless steel closed hat channel full-length of the shelf.

D. Wall-Mounted Shelves: 16-gauge stainless steel brackets 48” OC maximum, set in 6” from ends.

E. Freestanding Shelves: Where splash is required at free over shelves, turn up square 2” at ends, cove up at the rear, and hem tight to lower edge of front turndown. Weld exposed corners.

1. Freestanding over shelves: 16-gauge stainless steel cantilevered brackets at the rear of the table; double-cantilevered brackets at the center of the table. Posts for cantilevered over shelves are 1-5/8” OD x 16-gauge stainless steel secured to the underframe, 4’-0” OC. Ends of shelves: Secured to adjacent wall/fixture or mounted on 1¼” diameter stainless steel posts.

2. Freestanding over shelves not on cantilevered brackets: 1¼” OD x 16-gauge stainless steel posts, each pair at 4’-0” OC maximum.

F. Baker Table Over shelves: Supported 18” above the top with 1¼” OD stainless steel tubular supports with channel shoe secured to risers.

G. Glass/Cup Rack Over shelf at Dishtables: 14-gauge stainless steel with 1½" deep "vee" trough at free long sides with 1" tight hem inside the trough. Provide a ½" marine edge at free ends and; a 4" splash at the wall. Suspend shelf at 18" above dishtable surface on posts/brackets anchored to dishtable frame/wall at rear; 1" OD stainless steel tubing supports from the structure above the ceiling at front edge, 60" OC at each end.

1. Install at both ends a ½" stainless steel drain tube (connecting both vee-troughs) extended to the dishtable surface through splash turnback.

2. Rack-rest: horizontal full-length 1-5/8" OD stainless steel tubing supported at 10" OC above shelf (8" OC for double service shelf) by 1¼" OD stainless steel tubing with closed ends. Support tubing: welded, ground, and polished, spaced 60" OC.

3. Rack-rest supports to wall: 4" x 4" x 10-gauge stainless steel flange plates welded to support tubing. Anchor flanged plates to blocking ground with non-corrosive bolts.

2.27 DRAIN TRENCH LINER / GRATING

A. Liners: 14-gauge stainless steel in sizes as indicated.

B. Interior of liners: 6" deep with all interior corners (horizontal/vertical) coved on ¾" radius; sloped and scored 1" to integrally welded Component Hardware Model No. D34-Y011 basket drain assemblies @ 48" OC, fitted with 6" long welded tailpiece. Stainless steel safety chain: connected to basket strainer assembly and top of liner wall.

C. Liners: 1" wide perimeter shoulder at the top, turned up flush with finished floor, tight hemmed back down to the shoulder level, and flanged out 2" for attachment to the slab.

D. Underside of sloping liner portion: 2" long "Z" clips.

E. Grating: IMC-TEDDY PFD-ADA removable fiberglass grating:

1. 1" deep "I" bearing bars with 0.6" wide top flange.

2. Full perimeter frame, section quantities, and sizes indicated.

3. Maximum of 2'-0" sections.

4. Grating bars should be spaced 0.4" apart per ADA requirements.

5. Grating to be two (2) equal sizes.

2.28 WALL PANELS

A. Wall Panels: 18-gauge stainless steel, double pan-formed ½" thick with internal stiffener members. Fill with USDA-approved thermal insulation, full height, and width of panels, and attach to the interior with mastic. The maximum allowable temperature at the rear side of the panel: is 120°F.

1. Height of panels as required: Top of tile base to the underside of the hood, top of tile base to the top cap of stub wall, or top of splash to the underside of the hood.

2. Level and square lower edge and sides.

3. Butt joints on all panels.

2.29 EXHAUST HOODS (SURFACE-MOUNTED CONDENSATE)

A. Hoods: Size/shape as indicated: 18” high on the interior.

B. Body: 16-gauge stainless steel, with all seams welded, ground, and polished.

C. Continuous condensate trough at perimeter: 3” x 1”.

D. Frame the top of the hood with 1½” angle iron assembly and suspend from the structure above the ceiling by ½” diameter steel rods, drawn tight against the finished ceiling surface.

E. Duct opening/collar as specified with stainless steel louvered grille over the opening.

F. Div. 22 to extend drain line to floor sink when shown. The drain line is to be silver painted. Div. 22 to ensure all drain lines are centered over floor sink grate openings and no water splashes on the floor.

G. ½” diameter steel hanger rods at 4’-0” OC maximum to be by Kitchen Equipment Contractor, but they are to be anchored to the supporting structure (or slab) by the General Contractor in the locations required by exhaust hood shop detail.

H. Hoods and components to meet all NSF standards, NFPA 96, UL 710 and current IECC requirements.

2.30 EXHAUST HOODS (UNLESS SPECIFIED OTHERWISE)

A. Exhaust to be provided to meet all current local jurisdiction mechanical and energy code requirements. Kitchen Equipment Contractor to verify code requirements and coordinate with Divisions 23 and 26. Hoods over production equipment to be Type 1 with continuous capture. All Type 1 hoods should be 6’ deep to ensure smoke/steam capture unless otherwise noted.

B. Install fire suppression system(s) in all ventilators specified in this section. Install per the manufacturer’s recommendations and applicable codes or standards. Submit installation certification form to Architect.

C. Locate chemical cylinders as indicated on drawings and install piping to exhaust hood(s) in a concealed manner. Set cylinders and cabinets at 7’-0” clear AFF unless noted otherwise. Provide polished chrome plated tubing piping/fittings, where exposed at cylinder location and at the interior of exhaust ventilator—exposed pipe threads in/above the food zone are not allowed. Submit a schematic installation diagram and confirm critical distances from cylinders to nozzles.

D. Remote manual release located in the path of egress from the protected exhaust hood area. Kitchen Equipment Contractor to coordinate location with local Fire Marshal requirements before submittal review. All conduits will be recessed within the wall; SURFACE MOUNTING WILL NOT BE ACCEPTED.

E. Provide one (1) handheld Type ‘K’ and ABC 6-liter fire extinguisher per Ansul system, surface wall mounted.

F. Required quantity and sizes of mechanically operated gas valves.

G. Confirm interconnection of all equipment as required to ensure exhaust hood and fire suppression systems are entirely operational and meet local jurisdiction code requirements.

H. ½" diameter steel hanger rods at 4'-0" OC maximum to be by Kitchen Equipment Contractor, but they are to be anchored to the supporting structure (or slab) by the General Contractor in the locations required by exhaust hood shop detail.

I. Provide an appropriate quantity of fire suppression systems as required by local jurisdiction code requirements.

J. Double wall insulated construction at ends. S/S where exposed.

K. Hoods and components to meet all NSF standards, NFPA 96, UL 710 and current IECC requirements.

L. Refer to Section 1.4: OTHER DIVISIONS/CONTRACTORS RELATED WORK; Subsection E. Division 23 (Mechanical) for additional information.

2.31 HIGHLIGHTING

A. Polish the following vertical surfaces to a No. 8 finish:

1. Serving and display shelf turndowns.

2. Conveyor and dish/tray deposit station turndowns/frame.

3. Tray slide turndowns.

2.32 SHOP / FIELD JOINTS

A. Field joints: The least number is used only when equipment size must be limited for building or interior space access.

B. Stainless steel tops (including edges and splashes): Fully welded, ground, and polished to match adjacent surfaces.

C. Vertical field joints of fixture backsplashes that are inaccessible from the back: terminate 1" above the horizontal coved corner. The remaining height of the field joint: hairline butt joint with offset draw-angle behind. All horizontal/vertical draw joints: located and noted on shop drawings.

D. Hairline butt joint: 1½" x 1½" x 1/8" steel angles welded to the back/underside of countertop/shelf. Offset angle beyond joining metal edge ½" (min.) to provide a flat backing surface for a joint with the angle of other joining metal edge, set for ½" space between vertical legs of angles. Bolt sections together with 5/16" machine bolts, lock washers, acorn head cap nuts, set 3" OC.

E. Closed Base Bodies: Draw-type with hairline seam fully field-welded.

F. Millwork: Plastic laminated joints shall be dowelled, glued, and draw-bolted with fasteners.

G. Solid Polymer: Surfaces drawn tight, filled, sanded, and finished to match adjacent surfaces.

2.33 PREFABRICATED WALK-IN COLD STORAGE ASSEMBLIES

A. Assembly to be installed by Factory Authorized Installers only.

B. KEC to provide a 1-year walk-in assembly panel installation warranty. Panel installation warranty to cover labor and part replacement issues resulting from a failure to complete the following during installation:

1. Walk-in assembly panels to be installed square, plumb, and level.

2. To create a proper seal, ceiling panels must be installed flush and tight to wall panels with undamaged gasket material. Any signs of condensation at joints or assembly wall panels should be reported to FDP and addressed immediately. Caulk at panel seams will not be an acceptable solution.

3. All cam-locks should be engaged and cam-lock covers in place.

4. Any gaps under the floor angle (due to shimming) must be entirely sealed to the slab.

5. All penetrations in the ceiling or wall panels should be insulated and sealed by appropriate trade contractors and verified by KEC, including but not limited to Light Fixtures, Refrigeration Lines, Sprinklers, Temperature Sensors, etc.

6. Proper installation of the door systems should allow the door to self-close and seal around the perimeter of the door opening and at the floor threshold.

7. Final operation of the IC/IC+ control, door heaters, and light switches should be confirmed upon completion of the electrical connections.

8. Manufacturer to provide component-specific safety/emergency placards at the exterior and interior of all cold storage door assemblies. Signage to be mounted on door at ADA level when a window is not present or below view window when window is included **(see below)**.

9. The walk-in assembly panel installation warranty will cover service issues resulting from faulty installation.

4" X 4" PLACARD FOR INTERIOR OF WALK-IN COOLER AND FREEZER

7” X 10” PLACARD FOR EXTERIOR OF WALK-IN COOLER AND FREEZER

ENTRY PROCEDURE

- Authorized Personnel Only
- Notify Supervisor Before Entry
- Ensure Communication Device Is Carried If Only One Employee Working Within Kitchen
- Emergency Release Latch Located Inside
- Prior To Entering into Assembly, Slide “IN” Placard
- Open Door Using the Handle – Confirm It Swings Freely
- Enter With Awareness Of Emergency Release Latch Location Inside
- Leave Door Unblocked And Ensure No Obstructions To Exit
- Limit Time Inside – Do Not Linger Unnecessarily

EXIT PROCEDURE

- Exit Using Inside Latch If Alone, Or With Buddy If Paired
- Close Door Securely – No Slamming
- Report Any Damaged Latch, Alarm Malfunction, Or Ice Buildup Immediately
- Upon Existing Assembly, Slide “OUT” Placard

INTERIOR PROCEDURE

- Keep Communication Device ON If Only One Employee Working within Kitchen
- Do Not Stack Or Store Items Near The Door Release Mechanism
- Monitor For Early Signs Of Cold Stress (Numbness, Dizziness)
- Maintain Clear Pathways To The Door

C. **KEC is responsible for overall install accuracy/quality and quality control of work performed, regardless of the installer or any field modifications due to building/construction conditions. KEC is to provide the CSA Installation Approval Report (provided in this document) to Foodservice Design Professionals (FDP) upon completed installation, verifying that all items above have been inspected by the KEC for completeness and installed per manufacturer requirements. This report will be required as part of the completion of the contract.**

D. Sectional Assemblies: Size/shape indicated on drawings; 9'-6" interior clearance unless otherwise specified. Door locations/size: exactly as shown.

E. Sandwich Panel Insulation: Class 1 Urethane with a vapor barrier, 4" thickness (unless specified otherwise) with mature "U" factor of .030 or lower. Finished panels shall be UL-listed and demonstrate a flame spread rating of 20 or less. Panels must meet performance standards as outlined in U.S. Government legislation.

F. Wherever compartment dimension exceeds the clear-span ability of ceiling panels, provide I-beam support on the exterior of the ceiling or spline-hangers. Install ½" diameter steel rods through beams/hangers and secure them to the structure above. Beams or posts within compartments are not acceptable.

G. Reinforce prefabricated wall panels to rigidly support the door assemblies. The perimeter of the door and frame shall be built of a fiberglass reinforced polymer (FRP) pultrusion. All pultrusion's shall be non-conductive, non-corrosive, rust proof and NSF listed. All doors shall be furnished with a replaceable aluminum braided heater wire, electronically monitored, and controlled as to initiation temperature, termination temperature and percentage of operation time as required. Install 2" x 4" 16-gauge stainless steel hat-channel full-width of the jamb with 1/8" stainless steel removable flush sill, secured with stainless steel screws and sealed watertight to channel.

H. Reinforcement as required to be provided in panel for Push Button Panic Alarm and Release knob..

I. Provide an aluminum cove base at the interior and exterior of exposed panels (unless otherwise specified) for all floor assemblies.

J. Floor Installations:

1. **8-1/2" Recessed Floor Installation (if required):**

   a. Factory floor in slab recess with all joints lapped 6 inches and sealed to form a watertight seal.

   b. Level and square prefabricated perimeter and partition wall panels anchored to slab recess. Protect the exposed surface of panels.

   c. Provide and install factory or custom fabricated door threshold as required. To be flush and level to finished kitchen floor. Floor threshold to be surfaced with Graphene Oxide Anti-Slip or similar surface to reduce freezing and prevent slip hazards.

   d. 4" manufacturer's floor.

   e. 15# felt slip sheet over insulation with 6" lapped joints flashed up the height of the finished floor base.

f. 1/2” sand leveling bed by G.C.

g. Concrete flooring and tile over insulation by Divisions 03/09.

K. KE2 Therm Combo Display model no. 21877 (Unless otherwise specified). Integrated, flush-mounted temperature monitor/alarm with sensor and probe-cord length required to extend from the exterior front of the assembly to a mounting position of the sensor within the evaporator return airstream. System to have an easy-to-read LCD with high and low alarm set points with audible and visual alerts for alarm conditions. System to include Adaptive Programming for automatic set point control. Wi-Fi connectivity is included for remote notifications of alarms such as power failure, high and low temperatures, entrapment, and door open. System to include a built-in panic alarm. The system is to be interconnected to the Building Automation System (BAS) or the Owner’s Network (by Division 27) and to notify facility personnel of the district/owner choosing when activated. Refrigeration Installer to interconnect panic alarm to refrigeration system to shut off evaporator coils when panic alarm is engaged.

L. Kason Interior Panic Alarm model no. 1967-A7 (unless otherwise specified). Illuminated Push Button Panic Alarm with protective cover and Phenolic Label “PANIC” for entrapment **within Cooler and within Freezer** (ADA mounting height). Panic Alarm encasing is to be Safety Yellow/Black. ***Installer to maintain 18" clearance in front of controls for ease of access.***

Manufacturer to pre-run conduit within panel from Panic Alarm to junction above Cooler and Freezer door panel (or Cooler door if ‘inline’ assembly) for installation of Emergency Strobe/Horn and furnish loose (3) external Emergency Strobe/Horn Beacons. Division 11 40 00 to interconnect Panic Button to KE2 Switch at refrigeration system to disable refrigeration system when engaged.

Division 26 to install strobes/horns at locations indicated and interconnect to Panic Button at Walk-In Cooler and Walk-In Freezer junction. Division 27 will interconnect the Push Button Panic Alarm to the Building Automation System for Owner notification. Refer to Section 1.4: OTHER DIVISIONS/CONTRACTORS RELATED WORK; Subsections F. Division 26 (**Electrical**) and G. Division 27 (**Communication**) for additional information.

M. ***CRITICAL- Required: Manufacturer Representative to provide training on controls and inside emergency release mechanisms.***

N. LED surface-mounted light fixture, in quantity/arrangement shown on drawings. Light fixtures to be perpendicular to coils. Light fixtures wired to interior and exterior temperature control panel. Light fixtures are to be provided by Section 11 40 00 and installed by Division 26. Division 26 is to seal all conduit penetrations at light fixtures. KEC to verify that penetrations are sealed.

O. Penetrations of Panels: To be sealed by factory installer and appropriate trade contractors, with Dow Corning 3-6548 silicone RTV foam, total depth of the panel. Trim excess flush. KEC to verify that all penetrations are sealed.

P. Install closure panels and trim strips to building walls and ceiling with concealed attachment. Closure material: same as wall panels unless noted otherwise.

Q. Compartment Entrance Doors: 36” x 78” nominal clearance unless otherwise noted.

1. Mount hinged doors on two Kason Model No. 1346; polished chrome-plated nylon cam-lift hinges. All doors to be equipped with polished chrome Kason 1094 or equivalent door closer assembly. Doors to be adjusted so all doors fully self-close.

2. Hinge doors as indicated on drawings.

3. Defrost heater: Thermostatically controlled and replaceable at the entire perimeter of all doors. ***-CRITICAL- Defrost heaters to be wired for continuous service***.

4. 36" high x full-length diamond aluminum treadplate at front and rear of all hinged doors.

5. 12" x 2" engraved phenolic plastic compartment identification sign in Architect's color selection with 1" letters, mounted above door window.

6. 14" x 24" four-panel glass view window with heater and molded non-metallic inner and outer frame. The heater is to be wired and controlled via the door monitor for continuous service.

7. Padlock/key provisions in the door latch with safety release mechanisms.

8. Kason 1826 Intelli-Vent LED Heated Pressure Relief Ports with Dual Port Vent and Security Light. Locate Two (2) 12" below ceiling on Cooler/Freezer common wall panel and Two (2) 12" below ceiling on Cooler wall panel. If Cooler and Freezer are separate units, locate one on the Freezer wall panel as well, 12" below ceiling and mounted in the door frame assembly. All ports to have separate dedicated electrical connections and be wired for continuous service. Located and installed by Manufacturer.

9. Kason Model No. 1238 (unless specified otherwise) Pacesetter Locking Handle QTLC with twist-off knob disassembly type inside release.

10. Provide Three (3) Edwards 860 Series (or equal) red lens, surface-mounted Xenon Emergency Strobe Beacons. Div 26 will install one (1) located in the Kitchen in architectural ceiling above Walk-In Cooler door, one (1) located in the Kitchen in architectural ceiling above Walk-In Freezer door and provide the third unit located in the Cafetorium (Division 26 to coordinate location with Owners and Architect). Division 26 is to provide all conduit and wiring required and interconnect the Push Button Panic Alarm in the Walk-In Cooler and Freezer to Strobe Beacons (***Critical***).

R. Provide refrigeration calculations and refrigeration alarm to meet local jurisdiction code requirements.

S. If air screens or air shields are specified above doors or on the interior of the assembly, the manufacturer must provide adequate blocking in panels to support these components and pre-wired electrical connections. Installer to coordinate location of door closure to not interfere with air screens or air shields. Clear-VU, swinging door assemblies, are not required if air shields are specified.

T. S/S trim above walk-in assembly to conceal manufacturer ceiling grid.

U. Field-check all horizontal/vertical measurements and conditions at the building before fabrication or delivery of equipment.

V. Walk-in Assemblies to be installed by the **PRE-APPROVED INSTALLERS** listed below:

1. QBR Refrigeration, 30083 Hwy 90 Blvd., Katy, TX 77493, Mr. Andy Spellins, 713-973-2875, andy.spellins@qbrsales.com

2. Machine Ice, 8915 Sweetwater Ln., Houston, TX 77037, Mr. Will Weaver, 281-448-7823

3. Coolers Inc., 6922 Alder Dr., Houston, TX 77081, Mr. Lee Mamone, 713-665-8886

2.34 WALK-IN COLD STORAGE ASSEMBLY REFRIGERATION SYSTEMS

A. Unit Coolers: specified quantity and model, ceiling-hung by ½" OD nylon bolts with stainless steel washers and nuts. Insert hanger bolts through the plastic sleeve and seal penetration airtight.

1. Unit cooler drain fittings: positioned as indicated on drawings. Installation of cast tee-fittings on drain pan outlet with union and cleanout plug, and extension of 1" Type K copper drain line through wall panel to airgap fitting or floor drain under this Section.

2. Slope drain line ½" per foot, trap at the exterior of assembly and turn down into the drain. Manifold drain lines of adjacent compartments wherever possible.

3. Install drain line plastic sleeve through compartment wall, seal around drain line, and install stainless steel escutcheon with setscrews.

4. Electric drain line heater cable (self-regulating 7 watts): on all unit coolers operating below 36°F., installed from coil drain line fitting to wall penetration under this Section. Heater cables: the minimum rating of 15 watts/lineal foot, 208 volts, single phase. Wrap drain line with maximum 2" loop spacing and interwire to unit cooler for continuous operation.

5. Mounted, pre-piped, and pre-wired evaporator components:

   a. Sporlan thermostatic expansion valve with external equalizer.

   b. Shut-off valve at evaporator suction and liquid lines.

   c. Sporlan "Catch-All" refrigerant filter/dehydrator on liquid line.

   d. White Rogers 1609-101 adjustable thermostat with remote bulb positioned in return airstream of the evaporator.

   e. Electrical disconnect switch in NEMA 4 enclosure.

   f. **For any facility within 20 miles of a salt air environment:** Condenser and Evaporators to be built with Electrofin coating to retard salt air deterioration. Coils are to be coated with Technicoat 10-2 coating for protection against a salt air environment.

   g. 110° Ambient Temperature Operation.

6. Two (2) fan door activation switches to turn off evaporator coils when the door is opened. Interconnect door activation switches through Panic Alarm to turn off evaporator coils also when Panic Switch is engaged.

B. Refrigerant System Installation:

1. Refrigerant Lines; Type "L" rigid copper tubing. Fittings: Wrought copper or brass designed for use with high-temperature solder. Piping joints: Made with silver solder (Sil-Fos). Piping: Properly suspended from and anchored to the structure with adjustable hangers 6' OC maximum. Suction lines: Sized to have a maximum pressure drop of two pounds in medium-temperature systems; one pound in low-temperature systems. Liquid lines: Sized to give maximum pressure to prevent trapping of oil. Insulation on all suction lines: Armaflex insulation by Armstrong. ¾" thick at medium-temp 1" thick at low temp. Refrigerant lines in PVC conduit: Sealed at both ends with

Dow Corning 3-6548 silicone RTV foam. The refrigeration system installer will wrap Exterior Refrigerant Lines in the self-fastening jacket of Type 3003-H14 aluminum alloy, 0.016-inch thick. Provide aluminum strapping and seals for applying aluminum jackets and covers, per the manufacturer's recommendations, to ensure a completely weather-tight covering.

2. System to include a leak detection system as required for any A2L system with the capability to turn on the main blower, shut off compressors, and shut off any additional sources of heat in the system. Leak detection is critically important and must be wired to interrupt all controls when the system is in failure. System to include connectors for the Building Automation System or the Owner alarm system, as may be required for communication of alarm to the Owner. Connection to external systems by Div. 27. Refer to Section 1.4: OTHER DIVISIONS/CONTRACTORS RELATED WORK; Subsection G. Division 27 (**Communication**) for additional information

C. Evacuation and Charging:

1. After completion of the pressure test, the system shall be evacuated using an approved auxiliary vacuum pump. Connections for evacuation: Following the manufacturer's recommendations.

2. Charging the condensing unit (R454A Non-CFC Ozone Depletion Refrigerant for use in High, Medium, and Low Temp units) – (Refrigerant must meet Industry Standards and Local Codes): given through the charging valve in the high side, passing all the liquid refrigerants through a charging dehydrator. All charging lines and gauges must be purged of air before connection with the system. Refrigerant: unused and shall be delivered in a clean container. After the system is fully charged, start and place it in full operation.

D. Refrigeration system to be installed by the **PRE-APPROVED INSTALLERS** listed below:

1. QBR Refrigeration, Mr. Andy Spellins 30083 Hwy 90 Blvd., Katy, TX 77493, 713.973.2875, andy.spellins@qbrsales.com

2. Machine Ice, Mr. Will Weaver, 8915 Sweetwater Ln., Houston, TX 77037, 281.448.7823

3. Coolers Inc., 6922 Alder Dr, Houston, TX 77081, Mr. Lee Mamone, (713) 665-8886

2.35 PRE-APPROVED KITCHEN EQUIPMENT CONTRACTORS

A. Only the following named Subcontractors and those approved later, if any, are approved for inclusion in the Contractor's Bid.

B. **Any contractor requesting inclusion within this bid must submit AIA form 305 a minimum of 14 days before the bid date for review or as required by Architect.**

1. Stafford Smith, Mr. JP Garcia, 7129 North Loop East, Houston, TX 77028, Phone: 713.892.5001, Email: jpgarcia@staffordsmith.com

2. Texas Metal Equipment Company, Mr. Travis Andrews, 23518 Coons Road, Tomball, Texas 77375, Phone: 713.466.8722, Email: tandrews@tmeco.com

3. Kirby Restaurant Supply, Mr. Dave Newman, 809 S. Eastman Road, Longview, Texas 75602, Phone: 903.746.0421, Email: daven@kirbysupply.com

4. Mission Restaurant Supply, Mr. Robert Snoddy, 1126 S. St. Mary's Street, San Antonio, Texas 78210, Phone: 832.970.4020, Email: roberts@missionrs.com

5. Kommercial Kitchens, Mr. Terry Woodard, 13544 East Fwy., Houston, TX 77015, Phone: 409.769.1199, Email: terry@kommercialkitchens.com

6. Supreme Fixtures Co., Inc., Mr. Tim Hampel, 11900 Vinny Ridge Road, P.O. Box 193655, Little Rock, AR 72219, Phone: 501.455.2552, Email: tim@supremefixture.com

7. Amundsen Commercial Kitchens, Mr. Lewis Beville, 105 Montie, Longview, TX 75604, Phone: 903.576.6354, E-mail: lewis@afeok.com

2.36 PRE-APPROVED STAINLESS-STEEL FABRICATORS

A. Only the following named Subcontractors are approved for inclusion in the Contractor's Bid for Owner-approved custom fabrication of stainless steel counter assemblies. Any deviations from general specifications, basis of design, or quality of materials and workmanship will result in rejection and require the replacement of fabrication at Kitchen Contractor's expense. The pre-approved fabricators shown below shall not subcontract fabrication.

B. **Any fabricator not listed on the Pre-Approved list below requesting inclusion within this bid must submit AIA form 305 at least 14 days *before the bid date* for review (or as required by the Architect and Owner), or provision by fabricator will not be accepted. Upon approval of substitution, the fabricator shall not subcontract any portion of the fabrication.**

1. Texas Metal Equipment Company, Mr. Travis Andrews, 23518 Coons Road, Tomball, Texas 77375, Phone: 713.466.8722, Email: tandrews@tmeco.com

2. Kommercial Kitchens, Mr. Terry Woodard, 13544 East Fwy., Houston, TX 77015, Phone: 832.767.5287, Email: terry@kommercialkitchens.com

3. Mission Restaurant Supply, Mr. Robert Snoddy, 1126 S. St. Mary's Street, San Antonio, Texas 78210, Phone: 832.970.4020, Email: roberts@missionrs.com

4. CSS Manufacturing, Mr. Jared Woodard, 7430 Fairbanks North Houston Rd., Houston, Texas 77040, Phone: 832.444.6311, Email: jared.woodard@css-mfg.com

PART 3 - EXECUTION

3.1 DELIVERY AND INSTALLATION

A. Supervision: Provide a skilled and proficient foreman or supervisor who shall remain on the job during the entire installation.

B. Delivery: Coordinate with the progress of construction and Owner's operation schedules. Unless otherwise instructed and documented by Owner or General Contractor, the following procedures apply:

1. Field-assembled fixed equipment integrated into the structure (e.g., walk-in assemblies, exhaust hoods, drain trench/grate assemblies, conveyor systems, ceiling-mounted utensil racks) are to be sent to the job site when directed by the General Contractor and installed or protected accordingly.

2. All other Fixed Equipment: delivered after completion of work on adjacent finished ceilings, lighting, finished floor, wall systems (including painting), and painted gas lines.

3. Major Movable Equipment: delivered, when possible, to inventory in a secured area for interim job-site storage or, if the secured area is unavailable when fixed equipment installation/clean-up has been completed.

4. Minor appliances and loose items (e.g., pans, covers, flatware containers, etc.) should be delivered only when the Owner is prepared to receive and inventory such items.

C. Installation: performed by the manufacturer of custom fabricated fixtures.

1. Assemble, square, level, and ready all items for the final utility connections.

2. Cut neatly around obstructions to provide sanitary conditions.

3. Where gaps of ¼" or less occur adjacent to or between equipment, insert rope backing and smoothly apply General Electric construction sealant Series SE-1200 silicone mastic (clear color). Mask both sides of the gap for neat sealant application and remove excess. If space exceeds ¼," neatly install 18-gauge stainless steel trim molding of proper shape with concealed attachment. Use epoxy cement or "Z" clips wherever possible to secure stainless steel trim. Exposed edges or corners of trim: eased and smooth.

4. Refrigeration coil drain line runs to an indirect drain connection greater than 2" from the face of the wall or panel: Either of the following field procedures:

a. Trench the floor and provide a 6" wide x 2" deep 16-gauge stainless steel sloping (-1" to -2") trough from the face of the cooler/freezer wall to the body of the floor sink/floor drain. Trough: turned up 4" at the wall; ¾" flange with ½" turndown at both long sides. Set trough in waterproof mastic and seal 1" OD drain tube penetration into floor sink/floor drain at -2½" BFF. Patch the floor to match adjacent material/surface.

b. Provide 12" x 6" x 2" deep 16-gauge stainless steel condensate pan mounted to cooler/freezer wall at 6" AFF clear. Trench the floor and install a 1" OD drain line from the bottom of the pan to the body of the floor sink/drain. Slope drain line ¼" per foot and seal all connections watertight. Patch the floor to match adjacent material/surface.

D. Protection of Work:

1. Fabricated fixtures: Fiberboard or plywood taped to tops and exposed body panels/components.

2. Manufactured Equipment: Fiberboard or plywood taped as required by equipment shape and installation-access requirements.

3. Prohibited use of equipment: Tool and materials storage, workbench, scaffold, stacking area, etc.

4. Damaged Equipment: Immediately documented and submitted to the Owner with the Contractor's recommendation of action for repair or replacement and its impact on the Project Schedule and Contract Amount, if any.

3.2 CLEAN AND ADJUST

A. Clean up and remove all debris from this Work from the job site as the installation progresses.

B. Lubricate and adjust drawer slides, hinges, and casters.

C. Adjust pressure regulating valves, timed-delay relays, thermostatic controls, temperature sensors, exhaust hood grilles, etc.

D. Clean or replace faucet aerators and line strainers.

E. Touch-up damage to painted finishes.

F. Start up and check the operation of all refrigeration systems for at least 72 hours before acceptance.

3.3 EQUIPMENT START-UP/DEMONSTRATION

A. Carefully test, adjust, and regulate all equipment following the manufacturer's instructions and certify in writing to the Owner that the installation, adjustments, and performance are in full compliance.

B. Provide the Owner or food service Operators with a thorough operational demonstration of all equipment and furnish instructions for general and specific care and maintenance. Coordinate and schedule selected equipment items and attendees with the Owner at least two weeks before the demonstration starts.

3.4 FINAL OBSERVATION

A. Final observation will be made when the Contractor certifies that they have completed their work, thoroughly reviewed the installation/operation of each item in the contract and found it to comply with the Construction Documents.

B. Repetitive final observations (more than two) and all costs associated with it which may be incurred due to the Contractor's failure to comply with the requirements of this Article will be invoiced to this Contractor on a $70.00/hr and expense basis.

PART 4 - EQUIPMENT SCHEDULE

4.1 REGULARLY MANUFACTURED EQUIPMENT/COMPONENTS: Standard finishes and accessories unless specifically deleted or superseded by the Contract Documents.

4.2 FABRICATED AND FIELD-ASSEMBLED EQUIPMENT: Arrangement and configuration as shown on Plans, Elevations, Detail Drawings, and outlined in Specifications.

4.3 REFER TO DRAWINGS: For unit quantities and plumbing, electrical or mechanical provisions are required, including the manufacturer's optional voltages, wattages, burner capacities, etc.

4.4 REFER TO PART 2 – PRODUCTS: For accessories, fittings, requirements, and procedures related to the listed buy-out and fabricated equipment.

4.5 ALTERNATE MANUFACTURER REQUIREMENTS: A specific product manufactured by the listed pre-approved equals shown under Section 4.7 Food Service Equipment are acceptable only if the specific product can evidence compliance with the specified line items and the contract documents (Refer to Section 1.6; Sub-Section A.).

4.6 RE-USED EXISTING EQUIPMENT IF PROVIDED IN THIS PROJECT

A. Existing equipment scheduled for re-use is to be inventoried and documented that equipment is in operating condition once Kitchen Contractor has taken ownership.

B. Provide pictures of all equipment once inventoried and issue them to the architect to ensure that equipment has not been damaged.

C. Verify the locations of all equipment with the owner.

D. Existing equipment that is to be reused may need parts or accessories for proper and complete operation. Submit a report listing all items with pricing for approval to allow complete installation.

E. Utility disconnection and re-connection: Under Divisions 22 and 26. Kitchen Contractor to verify utility requirements of existing equipment and coordinate with Foodservice Design Professionals (FDP) as required. If utilities shown on FDP drawings do not match the requirements of existing equipment – KEC is to relay that to FDP immediately. All utilities not scheduled for re-use must be capped and covered by required disciplines.

F. Disassembly, removal, transportation, and relocation: under this Section and scheduled with General Contractor. The owner's representative must be present and coordinate the date/time with the owner.

G. Thoroughly clean inside and out before relocation.

H. Review functional parts (e.g., doors, controls, heating elements, compressors, etc.) and submit a report of required repairs and cost estimates. Any finishes or equipment damaged due to construction will be repaired as required.

I. Existing equipment not scheduled for reuse is to be carefully removed/relocated by the Kitchen Contractor per the Owner's direction. Kitchen Contractor to coordinate the date/time with General Contractor and Owner.

J. Removal or replacement of existing equipment is to be scheduled for times of least interruption and inconvenience to the food service operation. Submit the proposed time frame schedule, task sequence, and process for approval before starting work.

K. Kitchen Contractor to verify size and shape for all existing re-used equipment and coordinate with Foodservice Design Professionals (FDP) as required.

L. Any modification(s) required/desired for re-used existing equipment to be verified by the Kitchen Contractor. Before the changes are made, all modifications must be approved by the Owner and Foodservice Design Professionals (FDP).

M. The KEC is to verify and coordinate all the utility requirements with the construction documents as required. Refer to the general specifications regarding conflicts.

4.7 FOOD SERVICE EQUIPMENT

A. All equipment is to have a performance check from factory-authorized personnel. Warranties will begin on the day of the performance check.

B. All equipment and internal components should be of domestic origin where possible.

C. Architect to verify/coordinate the aesthetic options below (Food Service color, material, or signage selections) if these items are provided in this project:

1. Countertops: Stone (stainless steel is provided unless otherwise specified)
2. Tray slides: Corian or Stone (stainless steel is provided unless otherwise specified)
3. Counter fronts: Ceramic tile, 3 Form, or Plastic Laminate
4. Sneeze Guards: Stone insets
5. General color, material, and graphic selections:
    a. Display Air Screen Merchandisers – Color selection: Powder Coat or Plastic Laminate (stainless steel is provided unless otherwise specified)
    b. Bakery Display Cases – Color selection: Powder Coat or Plastic Laminate (stainless steel is provided unless otherwise specified)
    c. Pass Thru or Reach-In Holding Cabinets - Color selection: Powder Coat (Mfg.: True) or Plastic Laminate (Mfg.: Traulsen) (Stainless steel is provided unless otherwise specified)
    d. Hanging Heat Lamps – Track and Fixture color selection
    e. Heated Merchandisers
    f. Portable Guide Rails – Stanchion and Belt color selection
    g. Popcorn machine – Signage selection
    h. Bottle Cooler – Signage selection
    i. Graphics Package information
    j. Hot Food Well covers

D. Architect to verify/coordinate the finishes below:

1. Walls: Ceramic Tile, Flat FRP, or Molded FRP (Smooth, Impervious, and easily cleanable as approved by local jurisdiction)

2. Ceilings: Removable Vinyl Face Tile (Smooth, impervious, and easily cleanable as approved by local jurisdiction)

3. Floors: Tile, Epoxy, or Rubberized flooring system (Smooth, impervious, easily cleanable and slip resistant as approved by local jurisdiction) (Coordinate floor tile transition at serving lines)

4. Floors: Walk-in Assembly – Extend kitchen floor flush into Walk-in assembly with coved base

5. Furr Downs above Serving Counters

FOODSERVICE EQUIPMENT

ITEM NO. 101 AIR SCREEN

QUANTITY 1

Manufacturer:	Mars
Model:	STD248-1UA-OB
Size and Shape:	Refer to drawings
Alternate:	Berner

1. Air curtain, STD2 series model, unheated, obsidian black exterior. Size unit to fit door.
2. Air Curtain to include Model #J0036 Controller Kit. Controller kit to come complete with plastic magnetic reed switch model# 99-125, surface mounted, .50 HP max, 120v/1-ph limit switch. The magnet to be mounted on the surface of the door jamb and the door. (Over 48" or over 1 H.P., contact Representative for correct kit & model No.)
3. Confirm clearance above door prior to installation. Air Curtain to accommodate door width and height.
4. 11 40 00 to provide magnetic reed switch kit loose to General Contractor for installation by Division 26. Division 26 to route flexible conduit to j-box on cabinet. Routing to be clean and secured to building.
5. Provide Harsh Weather Cover if no awning or recessed door is provided.

ITEM NO. 102 COLD STORAGE ASSEMBLY

QUANTITY 1

Manufacturer:	American Panel
Model:	---
Size and Shape:	Refer to drawings
Alternate:	Thermokool

1. Installation to be completed by Factory Approved / Authorized installer. Refer to Section 2.33 Submittal drawings to include factory approval letter or certificate. The warranty will not start until letter has been provided to FDP confirming installation meets manufacturer requirements.
2. Manufacturer to review final installation and provide a letter confirming installation meets manufacturer requirements.
3. Assembly to have 9'-6” interior clearance.
4. 304 #3 finish 20 gauge stainless steel finish where exposed, 26 gauge acrylume where concealed.
5. 18-gauge stainless steel, type 304 (18-8), #3 finish trim where adjacent to walls and enclosure panels that extend to 2" above finished ceiling.
6. 3’-0” high diamond tread plate at exposed exterior surfaces. Fasten to wall with stainless steel fasteners. Coordinate hanging height with exterior cove base.
7. K.E.C. to provide aluminum cove base to interior and exterior of assembly. Provide sealant between floor and wall panels.
8. Interior walls to be baked white enamel embossed texture .040” aluminum.
9. Ceiling to be textured baked white enamel .040” aluminum.

10. Factory floor with smooth aluminum finish, recessed in slab 8 1/2". Secure floor to wall assembly with cam-lock assembly. KEC to ensure the floor assembly is level prior to the wearing bed installation. Kitchens finished floor to extend to walk-in. Critical: Floor to be smooth and level prior to concrete pour and at each stage of installation.
11. Threshold to be smooth and level with finished floor. Critical: Floor threshold to be surfaced with Graphine Oxide Anti-Slip or similar surface to reduce freezing and prevent slip hazards.
12. Two (2) 36" doors. Doors to be 20 gauge stainless steel, type 304 (18-8), #3 finish, with heated perimeter / door jambs / windows and threshold heaters. Each door to be equipped with 3'-0" high diamond tread kick plate on both sides of doors. Mount hinged doors on two (2) Kason model no. 1346 (or equal); polished chrome plated nylon cam-lift hinges. All doors to be equipped with polished chrome Kason 1094 or equivalent door closer assembly. ***-CRITICAL- Door Heater to be wired and set for continuous service.***
13. Each door to be equipped with 3'-0" high diamond tread kick plate on both sides of doors. Mount hinged doors on two (2) Kason model no. 1346 (or equal); polished chrome plated nylon cam-lift hinges. All doors to be equipped with polished chrome Kason 1094 or equivalent door closer assembly.
14. Provide Kason model No. 1238 door handles with 1239 twist-off knob disassembly type inside release.
15. Provide door bumpers at doors.
16. Doors to be provided with CCI Industries, Inc., Clear-VU swinging door assemblies, Alternate: Kason.
17. Reinforcement as required panel next to Cooler and Freezer door (handle side - interior) for Push Button Panic Alarm and Release Knob.
18. The Cooler and Freezer will have the KE2 Therm Combo Display model no. 21877 control panel with panic button tied into the Owner's network for notification. Control to be set for high/low limits. Route temperature sensor to be located to the side of evaporator coil. All interior controls to be located adjacent to each other with Panic Alarm to have dedicated Panic Button with Safety Yellow/Black Signage located at ADA level. Installer to maintain 18" clearance in front of controls for ease of access. -CRITICAL- Owner is to receive training on all controls and systems.
19. Provide 12” clearance at panic button.
20. Provide Kason Interior Panic Alarm model no. 1967-A7 illuminated Push Button Panic Alarm with protective cover and Phenolic Label “PANIC” for entrapment within Cooler and Freezer (ADA mounting height). Panic Alarm Encasing is to be Safety Yellow/Black. Manufacturer to pre-run conduit within panel from Panic Alarm to junction at panel above Cooler and above Freezer door (or Cooler door if ‘inline’ assembly) for installation of Emergency Strobe/Horn. Division 114000 furnish loose three (3) external Emergency Strobe/Horn Beacons and Div. 26 is to interconnect the Push Button Panic Alarm to external Beacons (One in architectural ceiling above the Cooler door, One in architectural ceiling above the Freezer door, and One in the Cafetorium in location as directed by Architect). Division 27 will interconnect the Push Button Panic Alarm to the Building Automation System for Owner notification.

21. KEC to coordinate location of network switch with cold storage assembly as required.
22. Interwiring of temperature monitor panel to master building alarm system or to the Owner's network. Technology department to provide all interfacing of alarm system and with the building alarm system. Conduit from refrigeration system to monitor by Division 26. Temperature Monitor installation at 4'-0" above finished floor. All conduit to be located above walk-in cooler/freezer ceiling. Exposed electrical conduit is not acceptable. Manufacturer to provide one copy of electrical wiring diagram in advance of installation and one copy of electrical wiring diagram as-built on completion of installation.
23. Freezer: One (1) lot LED light fixtures to operate in temperatures at -20 F. Lights to be installed perpendicular to coils.
24. Cooler: One (1) lot LED light fixtures. Lights to be installed perpendicular to coils.
25. Compartments to have all electrical concealed within the walls or located above the ceiling.
26. Electrical conduit for lights to be exposed, ran from fixture to fixture with no penetration in ceiling panel. Tap off existing light fixture circuit at door. Div. 26 to provide watertight conduit for lights.
27. Interior and exterior to be sealed with clear silicone. Stainless steel surfaces can be sealed by factory approved waterproof and mildew resistant aluminum based metallic sealant. All holes in assembly are to be sealed by assembly installer. Installer to confirm seal of all penetrations made by other trades and complete seal if necessary.
28. Kason 1832 Large Spring Valve Heated Pressure Relief Port. Locate at 12" below ceiling on cooler/freezer common wall panel and at 12" below ceiling on exterior cooler wall. All ports are to have separate dedicated electrical circuits. Pressure relief ports to be wired for continuous service. Relief port to be located, sized, and installed by Walk-in Manufacturer.
29. KEC to field verify all horizontal/vertical measurements and conditions at the building prior to fabrication or delivery of equipment.
30. KEC to provide 1-year walk-in panel installation warranty. KEC is responsible for overall install accuracy/quality and quality control of work performed regardless of installer or any field modifications due to building/construction conditions. KEC to provide Letter of Install Approval to FDP upon completed install.
31. Manufacturer to provide One Year Parts and Labor Warranty upon receipt of warranty letter.
32. ***-CRITICAL- Installer to verify continuous and proper operation of all door heaters and pressure relief ports.***
33. ***-CRITICAL- Required*: *Manufacturer Representative to provide training on controls and inside emergency release mechanisms.***
34. Provide safety/emergency placards at exterior and interior of cooler/freezer door assembly. Signage to be mounted on door at ADA level when a window is not present or below view window when window is included.
35. **Special Instruction:** Assembly to be connected to back-up generator per TISD standards.

ITEM NO. 103 REFRIGERATION SYSTEM-STANDARD

QUANTITY 1

Manufacturer:	RDT
Model:	ZS1-2 EcoSmart
Size and Shape:	Refer to drawings
Alternate:	---

1. Air cooled system.
2. System to include leak detection system as required for any A2L system with capability to turn on main blower, shut off compressors, and shut off any additional sources of heat in system. Leak detection is critically integral and controller is to be wired as to interrupt all controls when system is in failure. System to include connectors for Building Automation System or Owner alarm system as may be required for communication of alarm to Owner. Connection to external systems by Div. 27.
3. Scroll Compressors.
4. Cooler temperature to be +35 degrees.
5. Freezer temperature to be -10 degrees.
6. EcoSmart system on demand defrost.
7. Refrigeration system to accommodate 110F ambient exterior temperature. Coils to be oversized by 20%.
8. KE2 Evap Controllers located per Owner requirements.
9. Provide magnetic door activation switches at each door to turn off evaporator coils when the door is opened. Interconnect door activation switches through Panic Alarm to turn off evaporator coils also when Panic Switch is engaged.
10. S/S covered housing.
11. A dedicated electrical connection to be provided for heated condensate drain line. Refer to electrical plan for location.
12. All exterior piping to be aluminum wrapped.
13. System to accommodate Item No. 102 Cold Storage Assembly.
14. S/S covered housing mounted to a 24" tall 1/8 galvanized angle iron frame anchored to concrete pad with corrosion resistant bolts. Provide S/S skirting around frame.
15. Mount condensing unit on common exterior rack. Refer to Architectural and Engineering drawings for exact location of remote unit. Coordinate routing of refrigeration lines and conduit with appropriate trades. Heat tape and insulate all drain lines. General Contractor to seal all building penetrations at refrigeration lines.
16. Provide two (2) year parts and labor warranty for all parts and components (including third-party components that may be utilized).
17. Safety shut off valve (SSOV) is required. SSOV will consist of a solenoid valve for the liquid line and a suction line check valve. Both will be installed by the refrigeration contractor and should be installed on the exterior of the walk-in, within 10’ of the evaporator and in an accessible location for service.

18. SSOV liquid line solenoid valve will require additional field wiring, please refer to manufacturer drawing for connection points.
19. All evaporators should be supplied with two (2) factory installed refrigerant detection sensors (RDS).
20. RDS sensors will monitor the evaporator coil for any leaks. If a leak occurs, the RDS will initiate the mitigation process.
21. EcoSmart controller will REQUIRE a local area network connection for alarming purposes.
22. (A2L Only – Optional: if LAN is not possible) Buzzer/Strobe field connected to the EcoSmart controller for local alarming purposes.
23. In all multiple coil compartments KEC/Refrigeration installer to provide and install required quantity and length of Cat5/6e cable interconnecting each evaporator coil to manufacturers provided Network Switch.
24. Network switch to be located above cold storage assembly in location easily accessible for servicing.
25. KEC/Refrigeration installer to provide required Cat5/6e cable to interconnect network switch to nearest IDF/MDF room.
26. KEC/Refrigeration installer to run cables in a neat and clean fashion.
27. KEC/Refrigeration installer to ensure proper bonding of coils in all multiple coil compartments.

ITEM NO. 104 COLD STORAGE SHELVING

QUANTITY 2

Manufacturer:	Cambro
Model:	Camshelving Premium
Size and Shape:	Refer to drawings
Alternate:	---

1. Each unit to be four (4) tiers high with open grid mats.
2. Four (4) 74" post per unit. Provide foot plates at all posts when assembly is supplied with walk-in floor.
3. Refer to drawings for size, width and lengths.
4. Quantity Two (2) to equal One (1) lot: all shelving shown within cold storage assembly.
5. Verify shelving requirements with approved submittal prior to ordering.
6. Provide 12” clearance at panic button.

ITEM NO. 105 DUNNAGE RACK

QUANTITY 3

Manufacturer:	Cambro
Model:	Camshelving Premium
Size and Shape:	Refer to drawings
Alternate:	---

1. Size as shown.

ITEM NO. 107 DRY STORAGE SHELVING

QUANTITY 1

Manufacturer:	Cambro
Model:	Camshelving Premium
Size and Shape:	Refer to drawings
Alternate:	---

1. Each unit to be five (5) tiers high with open grid shelving.
2. Four (4) 86" posts per unit.
3. Quantity One (1) to equal One (1) Lot: all shelving shown within the dry storage room.
4. Refer to drawings for size, width and lengths.
5. Verify shelving requirements with approved submittal prior to ordering.

ITEM NO. 108 CAN RACK

QUANTITY 1

Manufacturer:	New Age
Model:	1250CK
Size and Shape:	Refer to drawings
Alternate:	---

1. Three (3) sets 1255, of shelf inserts to accommodate #5 and #10 cans.
2. Four (4) 6" plate casters, (2) swivel with brakes, (2) rigid.

ITEM NO. 109 ICE MAKER WITH BIN - 500 LB CAPACITY

QUANTITY 1

Manufacturer:	Hoshizaki
Model:	KML-500MAH/B-500
Size and Shape:	Refer to drawings
Alternate:	Manitowoc

1. Energy Star Rated.
2. Stainless steel bin.
3. Stainless steel legs.
4. Provide bin adapter kit as required.
5. Provide sizes and quantities as required: Dormont s/s water disconnect from filter to Ice Machine.
6. Cord and plug assembly, coordinate NEMA configuration with electrician.
7. One (1) pre-filter and water filter sized to manufacturers recommendations. Provide two (2) sets of replacement filters. Mount on wall adjacent to ice machine in an easily accessible location.
8. Coordinate cord and cap with receptacle. Water supply to filter to be hard copper plumbed. 72" long flex hose from filter to ice maker with 48" wall restraint cable. Interconnection thru water filter to ice machine and final connection by Division 22. Water filter overflow tube to be strapped to back side of ice machine and extend to 1" above floor sink.

ITEM NO. 110B STACKED WASHER & DRYER

QUANTITY 1

Manufacturer:	GE
Model:	Residential
Size and Shape:	Refer to drawings
Alternate:	---

1. Washer:
2. 3.5 cubic ft. capacity.
3. Straight vane agitator.
4. 9 wash cycles
5. 4 water temperatures.
6. "Quick pak" sound insulation.
7. Color to be white.
8. Water and drain hoses.
9. Dryer:
10. 5.9 cubic ft. capacity.
11. 4 Drying cycles
12. Auto dry.
13. Color to be white.
14. To include dryer cord and vent kit.
15. Units to include model stationary assembly including: white stack stand, dryer wall mount kit, door latch kit.
16. Contractor to provide current model numbers at the time of delivery.
17. ADA compliant.

ITEM NO. 111 CHEMICAL SHELF

QUANTITY 1

Manufacturer:	Cambro
Model:	Camshelving Premium
Size and Shape:	Refer to drawings
Alternate:	---

1. Each unit to be four (4) tiers high with open grid mats.
2. Four (4) 74" posts per unit.

ITEM NO. 121 TWO COMPARTMENT SINK W. DISPOSER

QUANTITY 1

Manufacturer:	Custom Fabricated
Model:	---
Size and Shape:	Refer to drawings
Alternate:	---

1. Top: 14 gauge type 304 S/S marine edge with 2" turndown at free sides.

2. Open base construction.
3. 10" high splash where adjacent to walls/fixtures.
4. Two (2) 24" x 26" x 15" deep sink compartments.
5. One (1) T&S model no. B-0291, splash mount faucet, 18" swing nozzle,LL inlets, for ¾" hot and cold water connections.
6. Two (2) Fisher 22306 twist waste valve 3 1/2" x 2" with overflow and tailpiece. Provide 18 gauge S/S bracket for drain handle welded to sink bottom.
7. Provide One (1) T&S model no. B-0133-EE-CR-8C pre-rinse, ***two (2)*** B-0108-C spray head, two(2) B-0109-04 18" long wall bracket (dealer to cut to correct length), one (1) additional spray face model no. 108SFRK with ceramic cartridges.
8. 16 gauge S/S undershelf per drawings.
9. Disposer - installed in top integrally welded disposer cone. Notch and punch splash turn back for vacuum breaker. 12 gauge S/S bracket mounted below counter top for disposer control panel ground and polished to match top.
10. 12" deep single post mounted overshelf at 18" above counter top, punched to accommodate spray rinse.
11. Post mounted utensil rack, extend 1-5/8" diameter S/S post from back splash, turn forward 12" and weld full length x 2" x ¼" S/S bar with Component Hardware model no. V-77-4401 S/S sliding hooks at 8" on center. Verify height with owner.
12. Omit rear rail at sink compartments, disposer and front rail at hose bibb.
13. Two (2) "Richlite" ½" thick removable sink covers installed at each sink. Weld ¼" bar stock, set 5/8" below work surface at all four corners for support of sink covers. Two (2) finger holes per board.
14. Provide top and bottom c-channel support storage for sink covers at right or left end of counter.
15. One (1) Edlund model no. S-11 Manual can opener, mounted on raised platform.
16. Flanged feet at front only.
17. Seal at all splash penetrations.

ITEM NO. 123 DISPOSER-CONE MOUNT

QUANTITY 2

Manufacturer:	Salvajor
Model:	300-CA-18-ARSS -LD
Size and Shape:	Refer to drawings
Alternate:	---

1. One (1) cone, one (1) sink mounted.
2. Fixed nozzle.
3. Delete standard syphon breakers and provide T & S B-0456-04 vacuum breakers and mount 6” from tabletop to base of breaker.
4. Solenoid valve.
5. Flow control.
6. Model no. ARSS-LD control panel.

7. Auto-reverse.
8. Dejamming tool.
9. Install vacuum breaker in splash
10. S/S cone cover.
11. Perforated silver saver and disposer cone with scrap ring.
12. Two (2) Swirl inlet located in disposer cone at a 45 degree angle.
13. GC to pipe 1/2" cold water to disposer body and swirl inlets. Excess electrical cord to be secured to fabrication as required. Install into counter by section 114000.

ITEM NO. 124 WORKTABLE W. OVERSHELF

QUANTITY 1

Manufacturer:	Custom Fabricated
Model:	---
Size and Shape:	Refer to drawings
Alternate:	---

1. Top: 14 gauge S/S top, type 304, with 2” turndown at all free sides. Provide 10" high backsplash at wall. Provide 10" high back/end splash at wall, equipment, columns, and chases as required.
2. Open base construction.
3. 16 gauge S/S overshelf post mounted 18" above working surface.
4. 16 gauge S/S undershelf.
5. Two (2) 20" W x 20" L drawer assemblies. Component Hardware #S52-2020 drawer slides with delrin bearings - 200lb capacity. Component Hardware #S81-2020C s/s drawer pan.
6. Closed back of splash when exposed.

ITEM NO. 125 20 QT. MIXER W. STAND

QUANTITY 1

Manufacturer:	Hobart
Model:	HL200
Size and Shape:	Refer to drawings
Alternate:	---

1. Food mixer, Bench Model, 1/2-HP motor, 20 qt. Capacity.
2. 115/60/1 ph.
3. 15 minute timer.
4. Epoxy enamel finish-bench model.
5. One (1) 20 qt. S/S bowl.
6. One (1) 20 qt. Aluminum "B" flat beater.
7. One (1) 20 qt. S/S "D" wire whip.
8. One (1) 20 qt. "ED" dough hook.
9. One (1) 20 qt. Lexan splash cover.
10. One (1) Caddy model no. T-242 mobile mixer stand, with casters, two (2) with brakes. Secure mixer to table with non-corrosive bolts. Alternate- New Age.

11. Stand to be Pre-Drilled to accommodate Mixer.

ITEM NO. 126 WORKTABLE W. SINK

QUANTITY 1

Manufacturer: Custom Fabricated
Model: ---
Size and Shape: Refer to drawings
Alternate: ---

1. Top: 14 gauge S/S top, type 304, with 2” turndown at all free sides. Provide 10" high backsplash at wall. Provide 10" high back/end splash at wall, equipment, columns, and chases as required.
2. Open base construction.
3. 12" deep single post mounted overshelf at 18" above counter top.
4. 16 gauge S/S undershelf.
5. 18 gauge butt joint wall panel from splash to underside of shelf.
6. Two (2) 20" W x 20" L drawer assemblies. Component Hardware #S52-2020 drawer slides with delrin bearings - 200lb capacity. Component Hardware #S81-2020C s/s drawer pan.
7. One (1) 15" x 18" x 10" deep sink compartment. Coordinate location with drain overflow.
8. One (1) T&S model no. B-0320-BB-CR , rigid gooseneck, ceramic cartridges, deck faucet for ¾" hot and cold water connections.
9. One (1) Fisher 22306 twist waste valve 3 1/2" x 2" with overflow and tailpiece
10. Provide 18 gauge S/S bracket for drain handle welded to sink bottom.
11. Omit rear crossrail at sink section.
12. Flanged feet at front legs.

ITEM NO. 127 SLICER WITH STAND

QUANTITY 1

Manufacturer: Hobart
Model: HS9N-1
Size and Shape: Refer to drawings
Alternate: ---

1. One (1) high/low fence assembly.
2. Tubular S/S food chute.
3. Cord and plug.
4. One (1) Caddy slicer T-249A stand with casters, two (2) with brakes. Alternate-New Age

ITEM NO. 128 UTILITY CART

QUANTITY 6

Manufacturer: Lakeside
Model: 522
Size and Shape: Refer to drawings
Alternate: Caddy

1. Four (4) N.S.F. approved non-marking casters, Two (2) with brakes.

2. Extended perimeter bumper.

ITEM NO. 129 WORKTABLE W. S.BAR UT.RACK

QUANTITY 1

Manufacturer: Custom Fabricated
Model: ---
Size and Shape: Refer to drawings
Alternate: ---

1. Top: 14 gauge type 304 S/S, 2" turn down at free sides.
2. Open base construction.
3. 16 gauge S/S undershelf.
4. Two (2) 20" W x 20" L drawer assemblies. Component Hardware #S52-2020 drawer slides with delrin bearings - 200lb capacity. Component Hardware #S81-2020C drawer pan.
5. Flanged feet.
6. Post mounted utensil rack, extend 1-5/8" diameter S/S post from cross rail, thru top to 78" A.F.F. and weld full length x 2" x ¼" S/S bar with Component Hardware model no. V-77-4401 S/S sliding hooks at 8" on center. Verify height with Owner.
7. Provide a duplex receptacle and housing mounted below countertop per drawings. Interconnect and prewire a 5'-0" cord and plug out of receptacle housing for plugging into ceiling drop cord receptacle. 114000 and Div. 26 to coordinate location of drop cord receptacle.

ITEM NO. 136 BAKER'S TABLE

QUANTITY 1

Manufacturer: Custom Fabricated
Model: ---
Size and Shape: Refer to drawings
Alternate: ---

1. Top: 14 gauge S/S top, type 304, with 2” turndown at all free sides. Provide 10" high backsplash at wall.
2. Provide finished back at exposed backsplash.
3. 12" deep post mounted overshelf at 18" above counter top.
4. 18 gauge butt joint wall panel from splash to underside of shelf.
5. One (1) tier of three (3) 20" x 20" x 5" deep all stainless steel drawers. To be in #18 gauge stainless steel housing having 3/4" radius (vertical) exterior corners. S/S drawer liners.
6. Rear rail only.
7. One (1) lot Rubbermaid no. FG360288WHT ingredient bins.
8. 16 gauge S/S flour trough.

ITEM NO. 138 PAN RACK

QUANTITY 7

Manufacturer:	CresCor
Model:	207-UA-13A
Size and Shape:	Refer to drawings
Alternate:	---

1. Four (4) 5" casters.
2. Adjustable universal slides on 1-1/2" centers.
3. Corner bumpers.

ITEM NO. 139 INSUL. MOBILE PROOFER

QUANTITY 1

Manufacturer:	CresCor
Model:	H-137-WSUA-12D
Size and Shape:	Refer to drawings
Alternate:	---

1. Insulated proofer/heated cabinet.
2. Field reversible doors.
3. Adjustable universal angles.
4. Four (4) 5" casters, two (2) with brakes.
5. Tempered glass door windows.
6. Key lock handle.
7. Corner bumpers.
8. Cord and plug. Coordinate NEMA configuration with Electrician.
9. Thermometer.
10. 1500 watt heater.

ITEM NO. 151 FIRE PROTECTION SYSTEM

QUANTITY 2

Manufacturer:	Ansul
Model:	R102
Size and Shape:	Refer to drawings
Alternate:	---

1. Duct and plenum protection to exhaust hood.
2. Surface protection for cooking equipment.
3. Locate remote fire pulls as recommended by Fire Marshal.
4. One (1) lot Mechanical gas valve (maximum diameter as required). Size as required. Furnished by Section 114000, installed by Division 22. Kitchen Equipment Contractor to coordinate location with local Fire Marshal requirements prior to submittal review. All conduits to be recessed within wall, SURFACE MOUNTING WILL NOT BE ACCEPTED.
5. System to meet U.L. 300 requirements.

6. Provide one (1) hand held Type 'K' and ABC 6 liter fire extinguisher per Ansul System, surface wall mounted. Verify mounting locations as required.
7. Exposed pipe threads are unacceptable.
8. All exposed piping to be chrome plated.
9. All hood penetrations to have U.L. listed "Quick Seal". Provide s/s escutcheons at all hood penetrations.
10. Provide phenolic I.D. labels for exhaust hood, remote fire pull, light/fan switches and fire protection system.
11. Provide a manufacturer performance test and report that verifies this system is fully operational.
12. Provide s/s cabinet as shown on plan.
13. Installer to provide one (1) Ansul system per exhaust hood, review drawings and provide systems as required.
14. Install hand held extinguishers, maximum of 3'-2" A.F.F. to top of unit.

ITEM NO. 152 EXHAUST HOOD

QUANTITY 1

Manufacturer:	Mod-U-Serve
Model:	W-CPB
Size and Shape:	Refer to drawings
Alternate:	---

1. Size and shape as per plan.
2. Supply Air. Ceiling mounted supply plenumwith light fixtures, coordinate conditioned/tempered air with engineer. Locate supply plenum in ceiling, coordinate location with GC as required.
3. U.L. Listed and fire rated 48” recessed LED lights located within the hood canopy. To meet minimum requirements of 50’ candles of illumination.
4. Simple wall mounted on/off switches for hood fans and lights to be provided by Division 26. Control panels will not be accepted.
5. Hood to meet requirements of ALL current local Mechanical and local Energy Codes.
6. Collars to be field installed. Coordinate with existing conditions and install as approved by Hood manufacturer.
7. All 18 gauge S/S construction. S/S finish where exposed.
8. For extended cooking line-ups provide Continuous Capture canopies without partitions between hoods.
9. Hood to have insulated front face and ends to allow for ceiling grid attachment where ceiling grid meets hood capture area.
10. S/S filters and grease cup. Provide filter removal tool.
11. ½" diameter steel hanger rods at 4'-0" O.C. maximum to be by Kitchen Equipment Supplier, but they are to be anchored to supporting structure (or slab) by the General Contractor in the locations required by exhaust hood shop detail.
12. All hood penetration to be fire rated and U.L. Listed and sealed with s/s escutcheons.

13. S/S c-channel closure panel from top of hood to ceiling.
14. S/S filler panel between hoods if back-to-back.
15. 4" air space at rear of hood. Provide S/S finished back where rear air space would otherwise be exposed.
16. Ductwork and final connection to hood above ceiling to be by the Mechanical Contractor.
17. Clearance requirement: Where any exterior surface of a hood is installed less than 18" from a combustible or semi-combustible surface, provide a minimum of 4" air space containing a code approved fire resistant material to that surface in a manner as prescribed by the manufacturer of that fire-resistant material. Protective materials provided by 3M Fire Barrier Duct Wrap 615+ and Fry Ware Elite are compliant with state and local mechanical codes. In addition, both systems meet the requirements of the testing standards of ASTM E2336 AND ARE THEREFORE APPROVED TO BE USED IN CLEARANCE REDUCTION APPLICATIONS.
18. Provide Mod-U-Serve model number ASTS-90 pre-set temperature sensor for automatic start of exhaust fan when the condition exists where the exhaust fan is not initiated at the wall switch and the temperature in the exhaust canopy reaches 110 degrees F. At the end of the cooking day when the fan is disengaged at the wall switch the thermostat (temperature sensor) will keep the exhaust fan on until the temperature in the exhaust canopy drops below 110 degrees F.
19. Refer to individual hood lengths as shown on drawings for each assembly required. Install at 6'-10" A.F.F. to bottom of hood, coordinate duct and fan requirements with Mechanical Contractor. Interconnect to wall mounted light switch by Division 26. Bulbs for light fixtures to be furnished and installed by Kitchen Equipment Contractor.
20. Mechanical contractor to test and balance exhaust hoods. Balance report to be provided to FDP upon completion.
21. **Special Instruction:** Refer to individual hood and plenum box lengths as shown on drawings for each assembly required. Install bottom of hood at 6'-10" A.F.F. Install plenum boxes recessed and interconnect to wall mounted light switch by Division 26.

ITEM NO. 153 EXHAUST HOOD

QUANTITY 1

Manufacturer:	Mod-U-Serve
Model:	W-CPB
Size and Shape:	Refer to drawings
Alternate:	---

1. Size and shape as per plan.
2. Supply Air. Ceiling mounted supply plenumwith light fixtures, coordinate conditioned/tempered air with engineer. Locate supply plenum in ceiling, coordinate location with GC as required.
3. U.L. Listed and fire rated 48” recessed LED lights located within the hood canopy. To meet minimum requirements of 50’ candles of illumination.
4. Simple wall mounted on/off switches for hood fans and lights to be provided by Division 26. Control panels will not be accepted.
5. Hood to meet requirements of ALL current local Mechanical and local Energy Codes.

6. Collars to be field installed. Coordinate with existing conditions and install as approved by Hood manufacturer.
7. All 18 gauge S/S construction. S/S finish where exposed.
8. For extended cooking line-ups provide Continuous Capture canopies without partitions between hoods.
9. Hood to have insulated front face and ends to allow for ceiling grid attachment where ceiling grid meets hood capture area.
10. S/S filters and grease cup. Provide filter removal tool.
11. ½" diameter steel hanger rods at 4'-0" O.C. maximum to be by Kitchen Equipment Supplier, but they are to be anchored to supporting structure (or slab) by the General Contractor in the locations required by exhaust hood shop detail.
12. All hood penetration to be fire rated and U.L. Listed and sealed with s/s escutcheons.
13. S/S c-channel closure panel from top of hood to ceiling.
14. S/S filler panel between hoods if back-to-back.
15. 4" air space at rear of hood. Provide S/S finished back where rear air space would otherwise be exposed.
16. Ductwork and final connection to hood above ceiling to be by the Mechanical Contractor.
17. Clearance requirement: Where any exterior surface of a hood is installed less than 18" from a combustible or semi-combustible surface, provide a minimum of 4" air space containing a code approved fire resistant material to that surface in a manner as prescribed by the manufacturer of that fire-resistant material. Protective materials provided by 3M Fire Barrier Duct Wrap 615+ and Fry Ware Elite are compliant with state and local mechanical codes. In addition, both systems meet the requirements of the testing standards of ASTM E2336 AND ARE THEREFORE APPROVED TO BE USED IN CLEARANCE REDUCTION APPLICATIONS.
18. Provide Mod-U-Serve model number ASTS-90 pre-set temperature sensor for automatic start of exhaust fan when the condition exists where the exhaust fan is not initiated at the wall switch and the temperature in the exhaust canopy reaches 110 degrees F. At the end of the cooking day when the fan is disengaged at the wall switch the thermostat (temperature sensor) will keep the exhaust fan on until the temperature in the exhaust canopy drops below 110 degrees F.
19. Refer to individual hood lengths as shown on drawings for each assembly required. Install at 6'-10" A.F.F. to bottom of hood, coordinate duct and fan requirements with Mechanical Contractor. Interconnect to wall mounted light switch by Division 26. Bulbs for light fixtures to be furnished and installed by Kitchen Equipment Contractor.
20. Mechanical contractor to test and balance exhaust hoods. Balance report to be provided to FDP upon completion.
21. **Special Instruction:** Refer to individual hood and plenum box lengths as shown on drawings for each assembly required. Install bottom of hood at 6'-10" A.F.F. Install plenum boxes recessed and interconnect to wall mounted light switch by Division 26.

ITEM NO. 161 CONVECTION OVEN

QUANTITY 2

Manufacturer:	Blodgett
Model:	DFG-100 DBL - Stacked
Size and Shape:	Refer to drawings
Alternate:	---

1. S/S front, top and sides.
2. Two (2) 1/2 HP 2-speed motors.
3. Natural gas.
4. SSI-M solid state infinite control with manual timer.
5. Electronic spark ignition.
6. Five (5) oven racks per compartment.
7. Dual pane thermal windows.
8. Simultaneous door operation.
9. Heavy duty casters, two (2) with brakes.
10. Provide quantities and sizes required: Dormont Model #VER-KIT-2S-48” Gas Conn. Kit, 48” long, Moveable Gas Connector Kit, covered with stainless steel braid, coated with blue antimicrobial PVC, SnapFast® Quick Disconnect, Swivel MAX®, full port valve, coiled restraining cable with hardware, limited lifetime warranty.
11. Dedicated gas connections, do not manifold.
12. Shunt trip breaker by Division 26.
13. Provide Eagle model CC-S, Stainless Steel Caster Cradle Stabilizing Device for all mobile production equipment under the exhaust hoods. Coordinate locations with the Owner prior to installation. Quantity One (1) equals One (1) lot. Alternate: Regency Stainless Steel Caster Placement System, model #600Safetyset.

ITEM NO. 162 CONVECTION STEAMER

QUANTITY 1

Manufacturer:	Cleveland
Model:	24CGA10.2 - Stacked
Size and Shape:	Refer to drawings
Alternate:	---

1. SteamChef™ 6 Convection Steamer, Gas, boilerless, double stacked, twelve (12) pan capacity. Stainless steel exterior, UL, NSF, and ENERGY STAR® rated.
2. Two (2) compartments each with individual connections.
3. 60-minute electro-mechanical timer & manual (continuous steaming) bypass switch.
4. Automatic drain & water level controls, KleanShield™ interior.
5. Model #ES26304466G equipment stand, 4" adjustable legs with flanged feet.
6. Provide quantities and sizes required: Dormont Model #VER-KIT-2S-48” Gas Conn. Kit, 48” long, Moveable Gas Connector Kit, covered with stainless steel braid, coated with blue antimicrobial

PVC, SnapFast® Quick Disconnect, Swivel MAX®, full port valve, coiled restraining cable with hardware, limited lifetime warranty.

7. Provide sizes and quantities as required: Dormont s/s water disconnect from filter to steamer,color coded for filtered and non-filtered water.
8. Provide filtration system as recommended by the manufacturer. Provide one set of replacement filters. Div 22 to interconnect equipment to the filter system.
9. KEC to coordinate filtered and unfiltered water with steamer, do not connect filtered water to unfiltered water connection.
10. Coordinate location; Floor sink to be outside equipment footprint and outside steam-free zone. Division 26 to provide shunt trip breaker.

ITEM NO. 163 30 GAL. TILT BRAISING PAN- GAS MANUAL TILT

QUANTITY 1

Manufacturer:	Groen
Model:	BPM-30GC
Size and Shape:	Refer to drawings
Alternate:	---

1. Tilt braising pan with easyDial Controls, selector dial with LED ring, large display screen.
2. Easy manual tilt, spring-assisted cover with vent.
3. Open leg frame.
4. S/S construction.
5. Steamer pan inserts.
6. Pan carrier.
7. Etch marks.
8. Double pantry swing faucet.
9. Provide sizes and quantities as required: Dormont s/s water disconnect from water connection to pantry faucet.
10. Flanged feet. Secure rear to floor with non-corrosive anchors.
11. Provide quantities and sizes required: Dormont Model #VER-KIT-2S-48” Gas Conn. Kit, 48” long, Moveable Gas Connector Kit, covered with stainless steel braid, coated with blue antimicrobial PVC, SnapFast® Quick Disconnect, Swivel MAX®, full port valve, coiled restraining cable with hardware, limited lifetime warranty.
12. Trench Liner to consist of:
13. S/S trench liner by 114000. Installation by G.C.
14. IMC/Teddy or Custom Fabrication.
15. Fibergrate: Gray #2 1" Thick, 1 1/2" squares mesh, Quartz grit top. Provide in two (2) equal sections, all ends to be finished ends.
16. 14 gauge s/s liner
17. IMC Teddy model no. BSPC basket strainer with pullout handle and chain.
18. Location of trench liner is critical. G.C. and 11 40 00 to verify location prior to concrete pour. Oversize trench liner block out to accommodate equipment pour path.

ITEM NO. 165 TWO BURNER RANGE

QUANTITY 1

Manufacturer:	Garland
Model:	MST4S-E
Size and Shape:	Refer to drawings
Alternate:	---

1. Cabinet base with door.
2. Removable cast iron grates.
3. Removable drippings tray.
4. 1" rear gas connections.
5. 5" gas flue riser if unit is at Production wall.
6. Set of (4) casters, 6" high (2) locking.
7. External pressure regulator.
8. S/S front end caps at manifold.
9. Provide quantities and sizes required: Dormont Model #VER-KIT-2S-48” Gas Conn. Kit, 48” long, Moveable Gas Connector Kit, covered with stainless steel braid, coated with blue antimicrobial PVC, SnapFast® Quick Disconnect, Swivel MAX®, full port valve, coiled restraining cable with hardware, limited lifetime warranty.
10. Provide Eagle model CC-S, Stainless Steel Caster Cradle Stabilizing Device for all mobile production equipment under the exhaust hoods. Coordinate locations with the Owner prior to installation. Quantity One (1) equals One (1) lot. Alternate: Regency Stainless Steel Caster Placement System, model #600Safetyset.

ITEM NO. 167 MOBILE WORKTABLE

QUANTITY 1

Manufacturer:	Custom Fabricated
Model:	---
Size and Shape:	Refer to drawings
Alternate:	---

1. Top: 14 gauge type 304 S/S with 2" turndown at all sides.
2. Open base construction.
3. 16 gauge S/S undershelf per drawings.
4. One (1) 20" W x 20" L drawer assemblies. Component Hardware #S52-2020 drawer slides with delrin bearings - 200lb capacity. Component Hardware #S81-2020C drawer pan.
5. 5" N.S.F. approved non-marking swivel casters, two with brakes.

ITEM NO. 172 COMBI OVEN

QUANTITY 1

Manufacturer:	Rational
Model:	Pro 6 Full/Pro 6 Full-G
Size and Shape:	Refer to drawings

Alternate: ---

1. Pre-Installation Site Consultation, to verify building utilities and access are in place for the units ordered prior to units being installed on site.
2. 208/240V 1PH
3. Standard door hinging.
4. Six (6) 18" x 26" or twelve (12) 12" x 20" pan capacity, per unit.
5. Standard warranty: 2-year parts and labor, installation inspection/start up.
6. Doors hinged per drawings.
7. Combi-Duo Stacking Kit, mobile.
8. Cleaner Tablets
9. Care Tablets.
10. Fry baskets, qty. 3 per oven.
11. KEC to coordinate pan accessories with Owner prior to ordering.
12. Four-hour chef training.
13. Heat shield.
14. Installation Kit "10", per unit, article number 8720.1560US.
15. Rational offers Certified Installation of units by Commercial Kitchens.
16. System installation to be reviewed by an authorized factory installer, provide report confirming installation meets factory's requirements.
17. Reverse Osmosis System: 3M Model Number SGLP200-CL-BP Steel mounting bracket. Div. 22 to provide all interconnection tubing and components required by RO system (Quick disconnect plumbing, cleaning bypass assembly, and connection fittings for standard 3⁄4" water line). Refer to Manufacturer's Data Sheet for mounting and connection instructions. Copper piping to the RO System by Div. 22. Plastic pipe or reinforced opaque beverage tubing from RO System to equipment by Div. 22. GC to provide wall blocking as required for mounting the system. System incoming water pressure must be between 60 and 100 psig or external pump will be required. Div. 22 to confirm and provide incoming water pressure booster pump as required.
18. Provide sizes and quantities as required: Dormont s/s water disconnect from filter to Combi Oven, color coded for filtered and non-filtered water.
19. KEC to coordinate filtered and unfiltered water with Combi Oven, do not connect filtered water to unfiltered water connection.
20. Provide quantities and sizes required: Dormont Model #VER-KIT-2S-48" Gas Conn. Kit, 48" long, Moveable Gas Connector Kit, covered with stainless steel braid, coated with blue antimicrobial PVC, SnapFast® Quick Disconnect, Swivel MAX®, full port valve, coiled restraining cable with hardware, limited lifetime warranty.
21. Provide Eagle model CC-S, Stainless Steel Caster Cradle Stabilizing Device for all mobile production equipment under the exhaust hoods. Coordinate locations with the Owner prior to installation. Quantity One (1) equals One (1) lot. Alternate: Regency Stainless Steel Caster Placement System, model #600Safetyset.

22. Water supply to have shut-off valve and back flow preventer furnished and installed by Division 22. Supply water to interconnect thru water filter and then to each oven. Indirect drain line to be ran outside of the footprint of the unit, coordinate location of the related floor sink.

ITEM NO. 187 PASS-THRU HEATED CABINET- 2DR

QUANTITY 3

Manufacturer:	Traulsen
Model:	HF-232WP
Size and Shape:	Refer to drawings
Alternate:	---

1. Stainless steel interior and exterior.
2. Interior lights with bulbs.
3. Exterior digital thermometer.
4. Locking hardware.
5. EZ-Clean Tray racks, for 18" x 26", 14" x 18" or 12" x 20" pans. Provide a total of (12) levels for each section.
6. Four (4) 6" casters with L14-30P plug.
7. Furnish startup and Six (6) years parts and labor warranty.
8. Controls mounted on kitchen side.
9. Full height doors hinged as per plan. Glass doors located on kitchen side, solid doors located on server side.
10. Re-hinging feature.
11. Fully welded telescoping S/S trim at wall. Trim is not to be secured to the equipment.
12. **Special Instructions:** Provide opening in wall 2" taller than equipment and 2" wider, KEC to coordinate with GC as required. Trim is not to be secured to the equipment. One (1) unit to be connected to back-up generator per TISD standards.

ITEM NO. 188 PASS-THRU REFRIGERATOR - 1DR

QUANTITY 3

Manufacturer:	Traulsen
Model:	HT-132WPUT
Size and Shape:	Refer to drawings
Alternate:	---

1. Stainless steel interior and exterior.
2. Interior lights with bulbs.
3. Exterior digital thermometer.
4. Locking hardware.
5. EZ-Clean Tray racks, for 18" x 26", 14" x 18" or 12" x 20" pans. Provide a total of (12) levels for each section.
6. Four (4) 6" casters with L14-30P plug.
7. Furnish start-up and Six (6) year parts and labor warranty.

8. Controls mounted on kitchen side.
9. Five (5) Year compressor warranty.
10. Full height doors hinged as per plan. Glass doors located on kitchen side, solid doors located on server side.
11. Re-hinging feature.
12. Fully welded telescoping S/S trim at wall. Trim is not to be secured to the equipment.
13. **Special Instructions:** Provide opening in wall 2" taller than equipment and 2" wider, KEC to coordinate with GC as required. Trim is not to be secured to the equipment. One (1) unit to be connected to back-up generator per TISD standards.

ITEM NO. 196 BACK COUNTER - OPEN BASE

QUANTITY 1

Manufacturer: Custom Fabricated
Model: ---
Size and Shape: Refer to drawings
Alternate: ---

1. Top: 14 gauge type 304 S/S, 2" turn down at free sides. 4" splash where adjacent to equipment and walls.
2. Open base construction.
3. S/S removable undershelf.
4. 6" S/S adjustable feet.
5. Grommet in countertop.

ITEM NO. 201 SERVING COUNTER

QUANTITY 1

Manufacturer: Mod-U-Serve
Model: ---
Size and Shape: Refer to drawings
Alternate: ---

1. Top: 14 gauge S/S top, 2" turn down at sides.
2. Countertop 34" high, trayslide at ADA approved mounting height.
3. Provide raised insulated platform in the front area of all hot food wells
4. Countertop at all hot food wells to be recessed 1" to accommodate 18" X 26" sheet pan.
5. 12" Corian trayslide with two (2) S/S runner insets mounted at 32" A.F.F.
6. Four (4) Hot/Cold built-in food wells with thermostat and manifold drain line into a common drain. Food wells to be insulated and located within a 1" recess, refer to counter sections.
7. One (1) Elite IV hot food breath protector with mirror finish posts, lights and heat lamps. Full service to self service adjustable breath protectors, with tempered glass display shelves. Heat lamp and lights to be on separate switches.
8. One (1) Moduserve DI-CP Series refrigerated cold pans located and sized per drawings. Provide on/off switch in control panel. Provide pan insert divider strip and perforated false bottoms.

9. One (1) Elite IV breath protectors with mirrored finished posts and two tier glass display shelf with lights at cold pan. Full service to self service adjustable breath protectors, with tempered glass display shelves.
10. Provide louvered doors at compressor compartments located on both sides of counter.
11. One (1) convenience outlet in each control panel.
12. Two (2) plumbing and One (1) load center compartment.
13. One (1) T & S Model No. B0208 – single pantry faucets w/ OC56 cast spouts. Two (2) T & S model no. 512.
14. Provide waterproof grommets in counter top for each piece of equipment mounted on counter.
15. Full length Component Hardware L75 Series lights located under trayslide pre-wired to single switch located in control panel. Provided and installed by Section 114000
16. Provide integral cashier station with cash drawer mounted to the underside of the countertop. Provide enclosed base below with interior shelf.
17. 6" S/S adjustable legs.
18. ¾" marine grade plywood at face of counter, ½" backerboard to be installed to provide for proper tiling. Tile by counter manufacturer. Color selection by Owner/Architect.
19. 18 gauge S/S kick plate with marine grade plywood backing.
20. 16 gauge S/S undershelves, refer to drawings.
21. Provide recessed electrical outlet in counter body at end of counter for milk coolers.
22. Coordinate connection to back-up generator per TISD standards.

ITEM NO. 209 DROP FRONT MILK COOLER - 8 CASE

QUANTITY 1

Manufacturer:	Mod-U-Serve
Model:	MCT-DM1
Size and Shape:	Refer to drawings
Alternate:	---

1. 18 gauge S/S fully welded liner.
2. 20 gauge S/S exterior.
3. Double pan insulated doors.
4. High pressure insulated foam.
5. 5" casters, two (2) with brakes.
6. ½" S/S nipple drain.
7. Locking mechanism.
8. Cord and plug. NEMA - 5-15P.
9. Corner bumpers.
10. 8 case capacity.
11. Strip curtains.
12. **Special Instruction:** Coordinate location of electrical receptacle to not interfere with location of milk dispenser.

ITEM NO. 211 DROP FRONT MILK COOLER - 12 CASE

QUANTITY 1

Manufacturer:	Mod-U-Serve
Model:	MCT-DM2
Size and Shape:	Refer to drawings
Alternate:	---

1. 18-gauge S/S fully welded liner.
2. 20-gauge S/S exterior.
3. Double pan insulated doors.
4. High pressure insulated foam.
5. 5" casters, two (2) with brakes.
6. ½" S/S nipple drain.
7. Locking mechanism.
8. Cord and plug. NEMA - 5-15P.
9. Corner bumpers.
10. 12 case capacity.
11. Strip curtains.
12. **Special Instruction:** Coordinate location of electrical receptacle to not interfere with location of milk dispenser.

ITEM NO. 213 MOBILE ICE CREAM DISPENSER

QUANTITY 2

Manufacturer:	Masterbilt
Model:	DC-2SSE
Size and Shape:	Refer to drawings
Alternate:	---

1. Stainless steel exterior.
2. Casters with brakes.
3. 14-gauge S/S top.
4. Locking mechanism.
5. One (1) Year parts and labor warranty.
6. Five (5) Year compressor warranty.

ITEM NO. 214 CASH REGISTER

QUANTITY 3

Manufacturer:	Owner Furnished
Model:	---
Size and Shape:	Refer to drawings
Alternate:	---

ITEM NO. 217 SERVING COUNTER

QUANTITY 1

Manufacturer:	Mod-U-Serve
Model:	---
Size and Shape:	Refer to drawings
Alternate:	---

1. Top: 14 gauge S/S top, 2" turn down at sides.
2. Countertop 34" high, trayslide at ADA approved mounting height.
3. Provide raised insulated platform in the front area of all hot food wells
4. Countertop at all hot food wells to be recessed 1" to accommodate 18" X 26" sheet pan.
5. 12" Corian trayslide with two (2) S/S runner insets mounted at 32" A.F.F..
6. Four (4) Hot/Cold built-in food wells with thermostat and manifold drain line into a common drain. Food wells to be insulated and located within a 1" recess, refer to counter sections.
7. One (1) Elite IV hot food breath protector with mirror finish posts, lights and heat lamps. Full service to self service adjustable breath protectors, with tempered glass display shelves. Heat lamp and lights to be on separate switches.
8. One (1) Moduserve DI-CP Series refrigerated cold pans located and sized per drawings. Provide on/off switch in control panel. Provide pan insert divider strip and perforated false bottoms.
9. One (1) Elite IV breath protectors with mirrored finished posts and two tier glass display shelf with lights at cold pan. Full service to self service adjustable breath protectors, with tempered glass display shelves.
10. Provide louvered doors at compressor compartments located on both sides of counter.
11. One (1) convenience outlet in each control panel.
12. Two (2) plumbing and One (1) load center compartment.
13. One (1) T & S Model No. B0208 – single pantry faucets w/ OC56 cast spouts. Two (2) T & S model no. 512.
14. Provide waterproof grommets in counter top for each piece of equipment mounted on counter.
15. Full length Component Hardware L75 Series lights located under trayslide pre-wired to single switch located in control panel. Provided and installed by Section 114000
16. Provide integral cashier station with cash drawer mounted to the underside of the countertop. Provide enclosed base below with interior shelf.
17. 6" S/S adjustable legs.
18. ¾" marine grade plywood at face of counter, ½" backerboard to be installed to provide for proper tiling. Tile by counter manufacturer. Color selection by Owner/Architect.
19. 18 gauge S/S kick plate with marine grade plywood backing.
20. 16 gauge S/S undershelves, refer to drawings.
21. Provide recessed electrical outlet in counter body at end of counter for milk coolers.
22. Coordinate connection to back-up generator per TISD standards.

ITEM NO. 218 SERVING COUNTER

QUANTITY 1

Manufacturer:	Mod-U-Serve
Model:	---
Size and Shape:	Refer to drawings
Alternate:	---

1. Top: 14 gauge S/S top, 2" turn down at sides.
2. Countertop 34" high, trayslide at ADA approved mounting height.
3. Provide raised insulated platform in the front area of all hot food wells
4. Countertop at all hot food wells to be recessed 1" to accommodate 18" X 26" sheet pan.
5. 12" Corian trayslide with two (2) S/S runner insets mounted at 32" A.F.F.
6. Four (4) Hot/Cold built-in food wells with thermostat and manifold drain line into a common drain. Food wells to be insulated and located within a 1" recess, refer to counter sections.
7. One (1) Elite IV hot food breath protector with mirror finish posts, lights and heat lamps. Full service to self service adjustable breath protectors, with tempered glass display shelves. Heat lamp and lights to be on separate switches.
8. One (1) Moduserve DI-CP Series refrigerated cold pans located and sized per drawings. Provide on/off switch in control panel. Provide pan insert divider strip and perforated false bottoms.
9. One (1) Elite IV breath protectors with mirrored finished posts and two tier glass display shelf with lights at cold pan. Full service to self service adjustable breath protectors, with tempered glass display shelves.
10. Provide louvered doors at compressor compartments located on both sides of counter.
11. One (1) convenience outlet in each control panel.
12. Two (2) plumbing and One (1) load center compartment.
13. One (1) T & S Model No. B0208 – single pantry faucets w/ OC56 cast spouts. Two (2) T & S model no. 512.
14. Provide waterproof grommets in counter top for each piece of equipment mounted on counter.
15. Full length Component Hardware L75 Series lights located under trayslide pre-wired to single switch located in control panel. Provided and installed by Section 114000
16. Provide integral cashier station with cash drawer mounted to the underside of the countertop. Provide enclosed base below with interior shelf.
17. 6" S/S adjustable legs.
18. ¾" marine grade plywood at face of counter, ½" backerboard to be installed to provide for proper tiling. Tile by counter manufacturer. Color selection by Owner/Architect.
19. 18 gauge S/S kick plate with marine grade plywood backing.
20. 16 gauge S/S undershelves, refer to drawings.
21. Provide recessed electrical outlet in counter body at end of counter for milk coolers.
22. Coordinate connection to back-up generator per TISD standards.

ITEM NO. 249 THREE COMPARTMENT SINK WITHOUT DISPOSER

QUANTITY 1

Manufacturer:	Custom Fabricated
Model:	---
Size and Shape:	Refer to drawings
Alternate:	---

1. Top: 14-gauge S/S 3" high 1-1/2" rolled rim at free sides, 10" high splash at walls.
2. Open base construction.
3. Omit rear rail at sink.
4. One (1) 30" x 26" x 15" and two (2) 24”x 26”x 15” deep sink compartments.
5. Two (2) T&S model no. B-0291, splash mount faucet, 18" swing nozzle, LL inlets, for ¾" hot and cold-water connections.
6. Three (3) Fisher 22306 twist waste valve 3 1/2" x 2" with overflow and tailpiece. Provide 18-gauge S/S bracket for drain handle welded to sink bottom.
7. 12" deep single post mounted perforated overshelf mounted at 18" above countertop.
8. 18-gauge butt joint wall panel from splash to underside of shelf.
9. Post mounted utensil rack, extend 1-5/8" diameter S/S post from back splash, turn forward 12" and weld full length x 2" x ¼" S/S bar with Component Hardware model no. V-77-4401 S/S sliding hooks at 8" on center.
10. 16-gauge S/S undershelf as per drawings.
11. Flanged feet at front only of counter.
12. Anchor flanged feet to floor with non-corrosive bolts. Secure wall mounted equipment / components to in wall grounds or anchor plates. Coordinate installation with the general contractor.

ITEM NO. 250 CONVEYOR DISHMACHINE W. EXTERNAL BOOSTER

QUANTITY 1

Manufacturer:	Hobart
Model:	CL44-BAS
Size and Shape:	Refer to drawings
Alternate:	---

1. Dishwasher, conveyor type, single tank design, 202 racks/hour capacity, S/S construction, with automatic fill, auto timer, and 115 volt pilot circuit.
2. 15 KW Electric tank heat.
3. 480/60/3.
4. Verify direction of dishmachine with drawings.
5. One (1) Extended warranty - One (1) Year parts and labor.
6. Interior Chamber height to be 4" taller than standard.
7. Single point electrical connection for Motors, Controls and Tank Heat. Div. 26 to provide S/S disconnect switches located as per plans interconnected to dishmachine and external booster heater.

8. Two (2) vent cowls with 4 x 16 vent and damper. Provide 18 gauge stainless steel seamless duct risers 6" above finish ceiling for final connection. The duct: trimmed at ceiling with 16 gauge stainless steel flange with all corners welded.
9. One (1) table limit switch with stainless steel cover to conceal back. Provided by Manufacturer / Installed by Div. 26.
10. Four (4) 20"x20" Peg racks.
11. Four (4) 20" x 20" sheet pan racks.
12. Two (2) 20" x 20" combination racks.
13. Vent fan controls.
14. KEC to verify local health codes if tempering kit required and not specified. Drain water tempering kit is to be installed by Hobart Service.
15. Peak Rate of drain flow = 38 gpm. Division 22 to provide and install backflow preventor between booster heater and filter. Final connection by Division 22. Coordinate location of electrical disconnects on free wall.

ITEM NO. 252 BOOSTER HEATER

QUANTITY 1

Manufacturer:	Hatco
Model:	C-30
Size and Shape:	Refer to drawings
Alternate:	---

1. Compact booster heater.
2. One (1) Brass Pressure Reducing Valve with By-Pass.
3. 6" adjustable S/S legs.
4. One (1) Phosphate water treatment unit. System to be located in an accessible location.
5. One (1) Shock Absorber.
6. S/S body and base.
7. Division 22 to provide and install backflow preventor between booster heater and filter. Final connection by Division 22. Interconnect to dishmachine by Division 22. Coordinate location of electrical disconnects on free wall. GC to insulate hot water from booster heater to dishmachine.

ITEM NO. 254 SOILED & CLEAN DISHTABLE

QUANTITY 2

Manufacturer:	Custom Fabricated
Model:	---
Size and Shape:	Refer to drawings
Alternate:	---

1. Top: 14 gauge type 304 S/S 3" high 1-1/2" rolled rim at free sides. 10" high splash at walls.
2. Install Disposer as shown. Notch and punch splash turn back for vacuum breaker. 12 gauge S/S bracket mounted below countertop and polished to match top for disposer control panel.

3. Provide One (1) T&S model no. B-0133-EE pre-rinse, B-0108-C spray head, two (2) B-0109-04 18" long wall bracket (dealer to cut to correct length), one (1) additional spray face model no. 108SFRK with ceramic cartridges.
4. One (1) Chicago model no. 305-VBRCF hose bibb and rack mounted on 12 gauge S/S bracket ground and polished to match top. Hose and spray rinse by owner.
5. One (1) 18" x 20" x 12" deep pre-rinse sink. Removable S/S rack guide assembly, when sink is shown.
6. Provide ½" slope in top towards dishmachine per the general specifications.
7. S/S corner filler at backsplash; slope to dishtable.
8. S/S cover to conceal table limit switch.
9. 2 1/2" backsplash at dishmachine portion, single thickness of s/s will not be accepted.
10. Anchor flanged feet to floor with non-corrosive bolts. Secure wall mounted equipment / components to in wall grounds or anchor plates. Coordinate installation with the general contractor.

ITEM NO. 255 MOBILE DRYING RACK

QUANTITY 3

Manufacturer:	Caddy
Model:	Camshelving Premium
Size and Shape:	Refer to drawings
Alternate:	---

1. Five (5) tier high with open grid shelving.
2. Four (4) 86" high posts.
3. Two (2) no. 5MP casters per unit.
4. Two (2) no. 5MPB locking casters per unit.
5. Two (2) bottom shelves equipped with sheet pan drying rack assemblies.

ITEM NO. 614 FILL FAUCET

QUANTITY 1

Manufacturer:	T & S
Model:	B-0610
Size and Shape:	Refer to drawings
Alternate:	---

1. Pot Filler Faucet, splash-mounted, 8" centers, vacuum breaker, flexible S/S hose, 68" long, hooked nozzle with self-closing valve, ½" IPS female inlets, built-in check valves.
2. 12" square 14 ga. S/S wall plate with hose rack with radius corners.
3. Install at 48" A.F.F. by Division 22. Coordinate height of backflow preventor with highest water level of associated equipment.

ITEM NO. 615 MENU MONITOR

QUANTITY 3

Manufacturer:	OWNER FURNISHED / CONTRACTOR INSTALLED
Model:	---
Size and Shape:	Refer to drawings
Alternate:	---

ITEM NO. 646 CUP DISPENSER

QUANTITY 1

Manufacturer:	Dispense Rite
Model:	CTC-L-3SS
Size and Shape:	Refer to drawings
Alternate:	---

1. Stainless steel exterior.
2. Condiment tray mounted above each unit.

ITEM NO. 647 TEA/COFFEE BREWER

QUANTITY 1

Manufacturer:	Bunn
Model:	52200.0000 - ITCB-DV
Size and Shape:	Refer to drawings
Alternate:	---

1. Tea/Coffee Brewer with Tray, dual voltage adaptable.
2. Digital readout displays in English/Spanish/French.
3. Infusion Series technology: (3) brew buttons & (2) batch sizes, BrewWISE® intelligence with pre-infusion & pulse brew, energy-saver mode, brew counter.
4. Includes integrated (3) position flip tray, overlay kit for customization.
5. USB programming capable.
6. Three (3) TDO-5 Brew Thru Reservoir, Two 2.5 Airpots.
7. Inline water filtration as recommended by manufacturer. Field verify installation (out of sight) below countertop where possible.
8. Dormont Water quick disconnects.
9. Locate per drawings.

ITEM NO. 651 ICE DISPENSER

QUANTITY 1

Manufacturer:	Servend
Model:	M45WD
Size and Shape:	Refer to drawings
Alternate:	---

1. Chilled water option.
2. Everpure water filter system sized per manufacturer's requirements. Water filter to be provided with filter and pre-filter. To be located in an easily accessible area.

3. Water dispenser.
4. Cord and plug assembly, NEMA 5-20.

ITEM NO. 676 STEAM TILTING KETTLE

QUANTITY 1

Manufacturer:	Cleveland
Model:	KGT-6-T/ST-28
Size and Shape:	Refer to drawings
Alternate:	---

1. Table top, 6 gallon capacity.
2. Manual tilt.
3. Support console on right, 2/3 jacket, 304 S/S construction.
4. One (1) ST-28 support stand with drain basket.
5. Kettle brush kit.
6. Cooking Baskets.
7. Spray Hose.
8. Lift off cover.
9. Self locking hand tilt mechanism.
10. Protective control panel.

END OF FOODSERVICE EQUIPMENT

SECTION 11 5700
CERAMICS KILN

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Ceramics Kiln

1.02 RELATED SECTIONS:

A. Division 26 – Applicable Sections

1.03 SUBMITTALS

A. Shop drawings, product data, and samples under provisions of Section 01 3000 – Administrative Requirements.

B. Product Data: Submit product data including electrical requirements.

C. Closeout Submittals:
   1. Submit under provisions of Section 01 7800 – Closeout Submittals.
   2. Maintenance Data: Include complete operating and maintenance manuals.
   3. Submit Material Safety Data Sheets under provisions of Section 01 7800 – Closeout Submittals for the following items:
      a. All mastics, glues and adhesives
      b. Fire doors (insulating material)

1.04 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Section 01 6000 – Product Requirements.

1.05 WARRANTY

A. Comply with requirements of Section 01 7800 – Closeout Submittals.

B. Submit a written warranty, executed by the Contractor, Installer, and Manufacturer, agreeing to repair or replace the kiln that fails in materials or workmanship within the specified warranty period.
   1. Warranty Period: Two (2) years after date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements indicated herein, provide products of one of the listed manufacturers.

B. Kilns:
   1. Olympic Kilns: www.greatkilns.com
   2. Paragon Industries, L.P.: www.paragonweb.com
   3. Skutt Ceramic Products: www.skutt.com
   4. Substitutions: Under provisions of Section 01 6000 – Product Requirements.

2.02 KILN

A. Basis of Design: Olympic Freedom 2827HE
   1. Size: Firing chamber 3” brick, 28” diameter, 27” deep, 10 cubic feet.
   2. Control: Bartlett V6-CF (12-key) Electronic Controller
   3. Electrical Requirements: 208v, 1 phase

2.03 ACCESSORIES

A. Mechanical Kiln Vent:
   1. Electrical: 115V, 60Hz, 1.1 amp
   2. CFM: 73

3. Ducting Requirements: Up to 60 feet of 4" duct material—galvanized furnace ducting, flexible aluminum ducting or PVC ducting (maximum four 90° turns)

B. Lid
   1. Provide counter weight lid lift system

C. Steel Stand
   1. 8” tall kiln stand with no-mar rubber feet.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General: Install according to manufacturer's written instructions. Install level, plumb, and true.

B. Large Components: Ensure that large components can be moved into final position without damage to other construction.

C. Comply with indicated requirements for installing service fittings, and electrical devices.

3.03 ADJUSTING

A. Adjust moving parts for smooth operation. Verify that counterbalances operate without interference.

3.04 CLEANING

A. Clean finished surfaces; touch up as required; and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

3.05 DEMONSTRATION

A. Demonstrate proper operation of kiln and accessories to Owner's designated representative.

END OF SECTION

SECTION 11 6133
THEATRICAL RIGGING SYSTEMS

PART 1 - GENERAL

1.01 SECTION SUMMARY

A. This specification describes the installation of the theatrical rigging equipment and stage drapery tracks at the Platform.

1.02 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.

1.03 RELATED WORK

A. Section 11 6143: Stage Draperies.

B. Section 11 6162: Theatrical Lighting Systems.

C. Section 27 4116: Integrated Audio-Video Systems.

D. Division 26: Electrical Work.

1.04 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)

1.05 DESCRIPTIONS AND REQUIREMENTS

A. 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.

B. General Requirements

1. The theatrical rigging system shall be comprised of overhead dead-hung pipe battens for support of temporary theatrical lighting equipment and draperies.
2. The rigging components shall follow the requirements stipulated in this section and on the notes on the TR drawings.
3. The rigging system is split between two general types of overhead batten:
    a. Electric Battens

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1) Electric battens shall be designed and installed to support lighting fixtures and associated wiring devices. Battens shall be dead-hung from overhead roof structure.

b. Drapery Battens

1) Drapery tracks and hardware shall be provided and mounted to dead-hung pipe battens to carry drapery as noted in the Lineset Schedule and Drapery Schedule

4. Draperies

a. The draperies shall be provided as scheduled in the Drapery Schedule and following the requirements noted in this section.

1) The traveler curtains, consisting of two (2) matched fabric panels, will part at center and draw open on a traveler track. The draw mechanism will be hand operated utilizing a sandbag weighted tension block for the operating line.

2) The tabs shall be track mounted; operation will be by hand using walk-along track hardware.

3) The valance and borders shall tie directly to dead-hung battens.

b. Drapery mounting conditions shall be field verified prior to fabrication.

1.06 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 Installer is responsible for making the field measurements necessary to establish exact locations, relationships, and load capacities necessary for the installation of these systems. Coordinate the work with the General, Electrical and other related contractors as stated in Part 1.3, 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 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.

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.

1.07 QUALITY ASSURANCE

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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 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.

1.08 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 installer 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 Installer's failure to include all required submittal information, or rejection of incomplete or improperly prepared submittal information, will be the responsibility of the Installer. 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 product(s) 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 SDS.
   2. Drawings:

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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 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 with a cover 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.

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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.

1.09 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 pdf files as follows:

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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 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 the Owner product damaged during storage, handling, or the course of construction.

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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 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. The 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.

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D. This warranty will include two (2) ANSI-compliant annual inspections. 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 inspection will be a level one inspection for all manually operated systems for year one and a level two inspection for year two. Both inspections will be a level two inspection for all motorized equipment. The Contractor shall provide the inspections at no additional cost to the Owner and at an agreed-upon time and date. The Contractor shall provide a full report with deficiencies or findings to the Owner and WJHW. 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 (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 (30) days prior to scheduled instruction sessions.
3. 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

2.01 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 outlined 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.

2.02 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.

2.03 CONTACTS

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A. Listed below is contact information for Manufacturers of rigging components approved to provide equipment on this project. The below is not listed any preference or preferred order:

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. Crosby Group, Inc.
   1. P.O. Box 3128, Tulsa, Oklahoma 74101
   2. Telephone: (918) 834-4611
   3. Approved to supply rigging hardware including chain, cable clips, cable, and anchor shackles.

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. IWeiss
   1. 815 Fairview Avenue Suite 10, Fairview, New Jersey, 07022
   2. Telephone: (201) 402-6500
   3. Approved to supply rigging hoists and controls, rigging hardware, stage drapery, fire curtain systems.

F. H&H Specialties
   1. P.O. Box 9327, South El Monte, Calif. 91733
   2. Telephone: (213) 283-3562
   3. Approved to supply stage rigging loft/head blocks, curtain tracks, and curtain motors.

G. K&M Fabrics
   1. 2 Waco Street, Greenville, South Carolina 29611
   2. Telephone: (800) 845-1896
   3. Approved to supply curtain fabric.

H. Protech Theatrical Services
   1. 3431 N Bruce Street. North Las Vegas, Nevada 89030
   2. Telephone: (702) 639-0290
   3. Approved to supply rigging hoists and controls, rigging hardware, stage drapery, fire curtain systems.

I. Thern, Inc.
   1. 5712 Industrial Park Rd, Winona, Minnesota, 55987
   2. Telephone: (800) 553-2204
   3. Approved to supply rigging hoists and controls, rigging hardware, fire curtain systems.

J. Ver Sales, Inc.
   1. 2509 N. Naomi Street, Burbank, Ca. 91504
   2. Telephone: (818) 567-3000
   3. Approved to provide rigging hardware including chain and beam clamps.

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K. Wenger (JR Clancy)
   1. 7041 Interstate Island Road, Syracuse, NY 13209
   2. Telephone: (315) 451-3440
   3. Approved to supply rigging hoists and controls, rigging hardware, stage drapery, fire curtain systems.

2.04 RIGGING HARDWARE

A. Batten Assembly
   1. Pipe battens shall be constructed of new ASTM A53/A 1-1/2" 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 designed by the Manufacturer for the intended use. Splice sleeves will 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 3/8” 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. Cap shall display linesets maximum capacity, and lineset number.

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 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. The screw pin shall be moused or seized to ensure the pin will not release.
   4. Alternative designs for batten connection and trimming methods shall require approval as part of the submittal process.
   5. Pipe Clamps
      a. Where a pipe clamp may be required on a batten, a wrap-around type clamp rated for the application shall be provided. This clamp shall be secured to the pipe using SAE 5 grade bolts, washers, and self-locking nuts.
      b. Provide clamps in black finish.
      c. All connections to dedicated stage electric battens shall be pipe clamp type.
   6. Acceptable products:
      a. 7 mm (0.275″) Grade 63 alloy chain
      b. Wenger/Texas Scenic: Alpha Chain

C. Wire Rope Lift Lines

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1. Provide lift lines and fittings appropriate for supporting the load requirements.
2. For utility and drapery sets:
    a. Lift lines shall be a minimum of 3/16” diameter 7 X 19 construction, galvanized wire rope with a breaking strength of 4200 lbs.
3. For shell and stage electric sets:
    a. Lift lines shall be a minimum of 1/4” diameter 7 X 19 construction, galvanized wire rope with a breaking strength of 7000 lbs.
4. All wire rope must be new; damaged or deformed cable may not be used.
5. Exposed ends of wire rope shall be cut cleanly, then seized.

D. Wire Rope Termination
1. To connecting hardware, form eyes around an appropriately sized thimble using solid copper Nicopress® compression sleeves.
2. To cable drums: terminate the wire rope on the inside of the lifting drum using a solid copper 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. ETC
    b. iWeiss
    c. ProTech Stage Rigging
    d. Thern Stage Equipment
    e. Wenger/Texas Scenic

2.05 SUPPLEMENTAL STRUT HARDWARE

A. Provide supplemental strut where required to bridge suspension points from disparate load-bearing structure, deck, or other assemblies.

B. Provide mating hardware to suspension components above.

C. Acceptable product:
1. Unistrut P-series channels selected and sized to the intended loads.
2. Approved equal

2.06 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 spacing in accordance with the Manufacturer’s requirements 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.

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5. Install carrier stops at each end of track.
6. Provide single carriers, spaced 12” on center, constructed of (2) black urethane-tired ball bearing wheels fastened parallel to carrier body. Supply carriers with heavy duty hook, swivel eye, back pack attachments 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 black urethane-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, or less, from the traveler tracks to reduce clearance required for pulley between pipe battens.
11. Provide a sand bag tension pulley for operation of hand line of the mid-stage traveler. Provide adequate quantity of sand for proper hand line operation.
12. When flown to low trim, sandbag should be at floor level.
13. Hand line shall be ½” diameter, stretch resistant rope with spun polyester outer jacket double braided over solid polyester core.
14. Hand line should be installed in a manner to minimize twisting of lines that interferes with operation.
15. 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 spacing in accordance with the Manufacturer’s requirements with two-piece hangers formed from 11-gauge steel.
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. For tab track assembles, provide lateral stabilizing connections connected to building structure at each end of the track to prevent swinging.
8. Ensure that all steel components are zinc plated for corrosion resistance.
9. Provide all track and associated hardware factory coated BLACK
10. Acceptable products:

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a. H&H Specialties series 300
b. ADC series 140

2.07 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 installer.
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

3.01 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

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K. In order to establish minimum standards of safety, the following factors will be used:
   1. Wire ropes and fittings provide a minimum 8:1 design factor; statically suspended wire rope, fittings, and hardware shall have a minimum 5:1 design factor
   2. Wire rope bending ratio is 30 times the rope 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.

3.02 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.

3.03 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.

3.04 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 6133

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SECTION 11 6143
STAGE DRAPERIES

PART 1 - GENERAL

1.01 SECTION SUMMARY

A. This specification describes the manufacture and installation of stage curtains at the Platform.

1.02 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.

1.03 SECTION INCLUDES

A. Coordination, provision, installation, inspection, commissioning, testing, documentation, instruction and warranties of a Stage Curtain 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.

1.04 RELATED WORK

A. Section 11 6133: Theatrical Rigging Systems.

B. Section 11 6162: Theatrical Lighting Systems.

C. Section 27 4116: Integrated Audio-Video Systems.

D. Division 26: Electrical Work.

1.05 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. Entertainment Services Technology Association (ESTA)

1.06 DESCRIPTIONS AND REQUIREMENTS

A. The following is intended to further describe the Work and clarify design intent and is not an exhaustive description of the Theatrical Rigging and Drapery Systems. Refer to the Theatre Rigging Systems (TR Series) drawings for further information relating to this Section.

B. Rigging and Drapery Systems: Platform

C. Draperies & Hardware

1. Drapery for the platform shall consist of a main drape, an upstage curtain and side tabs.

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2. All drapery and associated hardware shall mount on utility battens.
    a. The main drape and upstage blackout curtain shall consist of two (2) matched fabric panels, and will part at their centers and draw open on a traveler track.
    b. The main drape and upstage curtain draw mechanism will be hand-operated utilizing a sandbag-weighted tension block for the operating line, with 1’-6” of centerline track overlap (or a total of 3’-0” overlap)
    c. The upstage blackout curtain shall be provided with a rear-facing liner sewn to the curtain to prevent light bleed through the face fabric and to reduce visibility of the upstage window.
    d. Side tab curtains shall consist of multiple panels and operate via a walk-along curtain track

D. 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 platform 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.

1.07 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 Installer 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 Installer 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 Installer 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

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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.

1.08 QUALITY ASSURANCE

A. Stage Curtain Installer’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.

1.09 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 installer 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 Installer's failure to include all required submittal information, or rejection of incomplete or improperly prepared submittal information will be the responsibility of the Installer. 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

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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 SDS.

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. Provide complete assembly details of drapes including stitching schematics, weights, attachment details, and fabric/drape schedule.

c. General Detail Drawings. Provide detail drawings depicting any unique installation methods specific to each product.

d. 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. Use multiple volumes if necessary.
3. Provide each submittal with a unique number and be numbered in consecutive order.
4. Provide each submittal with a cover reflecting the project title and submittal number.
5. 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.

6. Separate major grouping with labels.
7. 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.
8. 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:

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1. These requirements represent minimum project requirements; a project's general conditions may require additional copies for project distribution.
2. Submit two copies of 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.

1.10 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) CD-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.

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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.

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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 Installer 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. Installer 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.

D. This warranty will include two (2) ANSI-compliant annual inspections. 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 inspection will be a level one inspection for all manually operated systems for year one and a level two inspection for year two. Both inspections will be a level two inspection for all motorized equipment. The Contractor shall provide the inspections at no additional cost to the Owner and at an agreed-upon time and date. The Contractor shall provide a full report with deficiencies or findings to the Owner and WJHW. All repairs covered by applicable warranties will be completed.

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.

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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 Installer 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

2.01 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.

2.02 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.

2.03 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

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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
5. IWeiss
   a. 815 Fairview Avenue Suite 10, Fairview, New Jersey, 07022
   b. Telephone: (201) 402-6500
   c. Approved to supply drapery, hampers, and miscellaneous associated equipment.

2.04 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 bottom 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 24” long white tie line added to the corresponding grommet.
   f. Curtains sewn with fullness shall have box pleats spaced 12” on center.

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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, and (1) on the bottom off-stage side of the bottom hem.

b. 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 product:

a. For nominal 24-25 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.

2.05 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 installer.

3. All electrical power, outlets, related systems, and structural elements required to make the system fully functional are the responsibility of the contractor.

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.

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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: ESTA, OSHA, ANSI, ASTM, NFPA, 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.

C. TRIMMING/RE-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

END OF SECTION

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SECTION 11 6623
GYMNASIUM EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Basketball backboards, goals, and support framing.

B. Wall mounted protection pads.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete floor slab to receive floor sleeves and anchors.

B. Section 05 1200 - Structural Steel Framing: Structural members supporting basketball systems.

C. Section 05 5000 - Metal Fabrications: Secondary structural members supporting gymnasium equipment.

D. Section 09 6466 - Wood Athletic Flooring

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023.

B. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. NFPA 101 - Life Safety Code; 2017.

E. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2015.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Large Components: Ensure that large components can be moved into final position without damage to other construction.

B. Electrically Operated Equipment: Coordinate location and electrical characteristics of service connection.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's data showing configuration, sizes, materials, finishes, hardware, and accessories; include:
   1. Electrical characteristics and connection locations.
   2. Structural steel welder certifications.
   3. Manufacturer's installation instructions.

C. Shop Drawings: For custom fabricated equipment indicate, in large scale detail, construction methods; method of attachment or installation; type and gage of metal, hardware, and fittings; plan front elevation; elevations and dimensions; minimum one cross section; utility requirements as to types, sizes, and locations.

D. Erection Drawings: Detailed dimensional requirements for proper location of equipment and court layouts.

E. Submit a copy of the latest UIL rules and regulations verifying compliance

F. Samples: Submit samples of manufacturer's available range of colors, textures, and graphics. Accompanying the submittal described above, submit Samples of each sealant, each backing material, each primer, and each bond breaker proposed to be used

G. Operating and maintenance data, for each operating equipment item.

H. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified with minimum three years of experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to project site in manufacturer's original packaging with factory original labels attached.

B. Store products indoors and elevated above floor; prevent warping, twisting, or sagging.

C. Store products in accordance with manufacturer's instructions; protect from extremes of weather, temperature, moisture, and other damage.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Backboard and goal shall have a life-time replacement warranty against breakage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Gymnasium Equipment:
   1. AALCO Manufacturing Company; www.aalcomfg.com.
   2. ADP Lemco, Inc.; www.adplemco.com.
   3. Arizona Courtlines, Inc; www.arizonacourtlines.com.
   4. Draper, Inc: www.draperinc.com/sle.
   5. IPI by Bison, Inc: www.ipibybison.com/#sle.
   6. Performance Sports Systems: www.perfsports.com.
   7. Porter Athletic Equipment Company: www.porterathletic.com.
   8. Sports Imports: www.sportsimports.com
   9. Substitutions: See Section 01 6000 - Product Requirements.

2.02 GENERAL REQUIREMENTS

A. All equipment model numbers equal to Porter Equipment Co.

B. See drawings for sizes and locations, unless noted otherwise.

C. Where mounting dimensions or sizes are not indicated, comply with applicable requirements of the following:
   1. National Federation of State High School Associations (NFHS) sports rules.
   2. United States Olympic association rules for the sport.

D. Provide mounting plates, brackets, and anchors of sufficient size and strength to securely attach equipment to building structure; comply with requirements of Contract Documents.

E. Hardware: Heavy duty steel hardware, as recommended by manufacturer.

F. Electrical Wiring and Components: Comply with NFPA 70; provide UL-listed equipment.

G. Structural Steel Fabrications: Welded in accordance with AWS D1.1/D1.1M, using certified welders.

2.03 BASKETBALL

A. Wall-Mounted Backstop Assemblies:
   1. Framing: Stationary framing.
      a. Side Court; model 00312-R10H
   2. Height Adjuster: Each backstop shall be provided with line height adjustment unit model 900 that raises or lowers assembly by 2 feet to adjust goal height from 8'-0" to 10'-0" A.F.F..
   3. Framing Color: Manufacturer's standard.

B. Ceiling-Suspended Backstop Assemblies:
   1. Framing: Center strut; forward folding; rear braced framing
      a. Main Court; model 90917-28
   2. Folding Control System: Electric hoist; Provide each retractable backstop with a model 706 1/2 H.P. for backstops under 28' or model 707 ¾ H.P. winch on backstops 28' & over. Winch and safety strap model 797 and key switch model 791. Refer to Section 08 7100 – Door Hardware for key cylinder.
   3. Height Adjuster: Each backstop shall be provided with line height adjustment unit model 900 to raise/lower assembly by 2 feet to adjust goal height from 8'-0" to 10'-0" A.F.F..
   4. Framing Color: Manufacturer's standard.

C. Backboards: Model 00208-300, 1/2" Tempered glass, rectangular shaped.
   1. Frame: Brushed aluminum edge, steel mounting.
   2. Dimensions: 42 inches high by 72 inches wide
   3. Markings: Integrally manufactured.
   4. Provide model 00-326 safety padding for bottom edge of backboard.
   5. Provide mounting kit.
   6. Color: As selected from manufacturer's standard selection.

D. Goals: Model 00252-500 steel rim, mounted to backboard, with attached nylon anti-whip net; complete with mounting hardware.
   1. Net Attachment Device: Tube-tie.
   2. Finish: Powder coat orange.

2.04 WALL PADDING

A. Wall Padding: Model 00570-1 with foam filling bonded to backing board, wrapped in covering; each panel fabricated in one piece.
   1. Surface Burning Characteristics: Flame spread index (FSI) of 25 or less, smoke developed index (SDI) of 450 or less, Class A, when tested in accordance with ASTM E84 as a complete panel.
   2. Flammability: Comply with NFPA 286.
   3. Covering: Vinyl-coated polyester fabric, mildew and rot resistant; stapled to back of board.
      a. Color: As selected from manufacturer's standard range.
      b. Texture: Embossed leather-look.
      c. Fabric Weight: 14 oz/sq yd.
   4. Foam: Open cell polychloroprene (Neoprene) 6 pcf nominal density.
   5. Foam Thickness: 2 inches.
   6. Backing Board: Oriented strand board.
      a. Thickness: 7/16 inch.
      b. Surface Burning Characteristics: Flame spread index (FSI) of 25 or less, smoke developed index (SDI) of 450 or less, Class A, when tested in accordance with ASTM E84.
   7. Panel Dimensions: 24 inches wide by 70 inches long, no nailing margins.
   8. Mounting: Removable; Model 00347-100 and 00347-300 mounting hardware. Set wall pads 2" above floor elevation

B. Specially Shaped Padding: Same construction as standard padding; custom fabricate to fit irregularly shaped members, areas, and protrusions in gymnasium as indicated; provide padding for:
   1. Wall corners.
   2. Hand Rail and Guard Rail

C. Round Column Padding: Same construction as standard padding; made to fit; with grommet strip on each long side of pad, provide laces.

PART 3 EXECUTION

3.01 EXAMINATION

A. Take field measurements to ensure proper fitting of work. If taking field measurements before fabrication will delay work, allow for adjustments within recommended tolerances.

B. Inspect areas and conditions before installation, and notify Architect in writing of unsatisfactory or detrimental conditions.

C. Do not proceed with this work until conditions have been corrected; commencing installation constitutes acceptance of work site conditions.

D. Verify that electrical services are correctly located and have proper characteristics.

3.02 INSTALLATION

A. Install in accordance with Contract Documents and manufacturer's instructions.

B. Coordinate installation of inserts and anchors that must be built in to flooring or subflooring.

C. Install equipment rigid, straight, plumb, and level.

D. Secure equipment with manufacturer's recommended anchoring devices.

E. Install wall padding securely, with edges tight to wall and without wrinkles in fabric covering.

F. Separate dissimilar metals to prevent electrolytic corrosion.

3.03 ADJUSTING

A. Verify proper placement of equipment.

B. Verify proper placement of equipment anchors and sleeves, and use actual movable equipment to be anchored if available.

C. Adjust operating equipment for proper operation; remove and replace equipment causing noise or vibration; lubricate equipment as recommended by manufacturer.

3.04 CLEANING

A. Remove masking or protective covering from finished surfaces.

B. Clean equipment in accordance with manufacturer's recommendations.

3.05 PROTECTION

A. Protect installed products until Date of Substantial Completion.

B. Replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 11 6833
ATHLETIC FIELD EQUIPMENT

PART 1 – GENERAL

1.01 DESCRIPTION

A. The Contractor shall provide various sports athletic equipment as shown on the drawings and/or here-in, including all labor, materials, equipment and incidentals necessary and required for their completion as indicated on the drawings.

B. Related Work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions and Sections in Division 01 of these Specifications.

1.02 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.03 SUBMITTALS

A. Comply with pertinent provisions of Section 01 3000 – Administrative Requirements.

B. Product Data: Within 15 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
   1. Materials list of items proposed to be provided under this Section;
   2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
   3. Shop Drawings in sufficient detail to show required anchorage and interface of the work of this Section with the work of adjacent trades;
   4. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

C. Shop Drawings:
   1. Submit dimensioned court layouts including:
      a. Equipment locations
      b. Striping width and color
      c. Proposed colored graphic or logo
   2. Submit a copy of the latest UIL rules and regulations verifying compliance.
   3. Provide engineered stamped drawings for backstop systems.
      a. Shop drawing sheets that include engineering information designed by the Contractor’s Delegated Design Engineer shall be signed and sealed in accordance with the Texas Engineering Practice Act. Sheets that do not provide information designed by the Contractor’s Engineer do not require being signed and sealed. Calculation packages require a signed and sealed cover sheet only. Any submittals requiring to be signed and sealed that are received without the signature and seal will be rejected without review.

D. Samples: Accompanying the submittal described above, submit Samples of each sealant, each backing material, each primer, and each bond breaker proposed to be used.

1.04 PRODUCT HANDLING

A. Comply with pertinent provisions of Section 01 6000 – Product Requirements.

1.05 WARRANTY

A. The contractor shall furnish a written guarantee warranting all materials, devices, and workmanship to be free of defects for a period of one year from the date of completion and acceptance. Any defects in materials, devices, and workmanship which become apparent within the guarantee period shall be repaired or replaced by the contractor at his own expense, and at no additional cost to the Owner.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. To establish the minimum functional, aesthetic and quality standards, products and product series of the manufacturers listed below are required.

B. Substitutions: Products of other manufacturers are acceptable provided they meet the performance and reliability standards of the recommended equipment. Any substitution to this list must be submitted and approved in writing 10 days prior to the bid date.

2.02 BASKETBALL BACKSTOPS AND SUPPORTS

A. Manufacturers
   1. Porter Equipment Co.: www.porterathletic.com
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Backstop supports shall have the following attributes:
   1. Backstop Supports:
      a. Model # 00176-334.
      b. Mounting Height: 10’-0”
      c. Protective pad: Model #00069-000, 6’ h lace-on pad.
   2. Backstops:
      a. Model # 00234-300 fan shaped cast aluminum backstop, (54” x 39”), painted white with orange outline and target.
      b. Model # 01216-000, removable goal adaptor.
      c. Model # 00202-00 goal.
      d. Model # 601-120, Provide zinc plated chain nets.

2.03 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Take field measurements to ensure proper fitting of work. If taking field measurements before fabrication will delay work, allow for adjustments within recommended tolerances.

B. Inspect areas and conditions before installation. Notify Architect in writing of unsatisfactory or detrimental conditions. Do not proceed until conditions have been corrected. Commencing installation constitutes acceptance of work site conditions.

3.02 INSTALLATION

A. Install in accordance with contract documents and manufacturer's instructions.

B. Install equipment rigid, straight, plumb, and level.

C. Secure all equipment with manufacturer's recommended anchoring devices.

3.03 GUARANTEE - EQUIPMENT

A. The contractor shall furnish a written guarantee warranting all materials, devices, and workmanship to be free of defects for a period of one year from the date of completion and acceptance. Any defects in materials, devices, and workmanship which become apparent within the guarantee period shall be repaired or replaced by the contractor at his own expense, and at no additional cost to the Owner.

3.04 PROTECTION

A. Protect installed products until Substantial Completion.

B. Replace damaged products before Substantial Completion.

END OF SECTION

SECTION 12 2100
WINDOW BLINDS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Horizontal Blinds

1.02 RELATED WORK

A. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 01 of these specifications.

1.03 REFERENCE STANDARDS

A. WCMA A100.1 - Safety of Window Covering Products; 2022

1.04 SCOPE

A. Furnish and install window blinds in accordance with specifications, drawings, and contract documents.

B. All workmanship, details and procedures shall comply with current manufacturer's recommendations.

C. General locations and detail of system are shown on the drawings and/or window schedule.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product literature and installation instructions.

C. Shop Drawings: Indicate field-measured dimensions of opening which are to receive blinds, details on mounting surface and sill conditions, and details of corners and conditions between adjacent blinds.

D. Samples for selection of Colors: Submit manufacturers full range of colors.

1.06 WARRANTY

A. Limited Lifetime Warranty: Manufacturer shall repair or replace for the life of the blind, at its option, without charge to the Owner, any part found defective in workmanship or material as long as the blind remains in the same window for which it was purchased.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURER

A. Levolor Contract: www.levolor.com.

B. Hunter Douglas: www.hunterdouglascontract.com.

C. Spring Window Fashions, LLC: www.springwindowfashions.com

D. Substitutions: See Section 01 6000 - Product Requirements.

2.02 HORIZONTAL BLINDS

A. Basis of Design: Levolor Contract; Riviera Contract 1" Blind, model #RIV1C.

B. Materials:

1. Head Channel shall be of .025" thick Tomized steel, U-shaped 1" high x 1-9/16" wide with flanged edges at top, and coated with a baked-on finish. All hardware shall be enclosed in the metal head.
2. Guardian Tilter TM shall be of .042" Tomized steel or of .040" nylon with automatically disengaging worm and gear mechanism to eliminate overdrive and prevent strain or damage to blind.
3. Tilt Wand shall be transparent with a hexagonal cross section 5/16" across flats.

4. Lift cords are not allowed in compliance with WCMA A100.1 - Safety of Window Covering Products; 2022.
5. Drum and Cradle shall be provided for each blind ladder.
   a. Drum shall be of .031" Tomized steel having two holes with rolled edges to anchor barbs of both ladder ends.
   b. Cradles shall be of .042" thick Tomized steel, having two holes with rolled edges to guide cords through bottom of head channel without abrasion.
6. Tilt Rod shall be U-shaped with a circular radius of approximately 1/8" designed to achieve minimum torsional deflection. For blinds over 60" wide and under 80" long or over 55" wide and over 80" long, tilt rod shall be a solid D-shaped rod with an average cross section of 1/4" designed to achieve minimum torsional deflection.
7. End Braces shall be of .037" thick Tomized steel with reinforcing ribs and field adjustable tabs.
8. Installation Brackets shall incorporate a rivet-hinged safety locking front cover and shall be at least .048" thick Tomized steel with baked-on finish to match head channel.
9. Intermediate Brackets shall be .050" Tomized steel and shall be installed with blinds over 60" wide and under 80" long or over 55" wide and over 80" long.
10. Ladders (slat supports) shall be of braided polyester yarn designed for maximum strength and flexibility combined with minimum stretch. Rungs shall consist of not less than two crossed cables inter-braided with the vertical components. Ladders shall support the slats without visible distortion. Distance between ladders are not to exceed 23" for blinds over 80" long. For blinds up to 80" long, distance between ladders shall not be greater than 22".
11. Slats shall be of virgin aluminum alloyed for maximum strength and corrosion resistance. Slats shall be nominally 1" wide with an elliptical crown formed after coating and curing. Slat thickness and ladder support distances shall prevent visible sag or bow after continued use indoors. Slats shall be un-perforated.
12. Bottom Rail shall be of .031" Tomized steel formed after coating and shall be provided with color-compatible molded plastic ladder and end caps.
13. Color of blind shall be as selected by Architect.
14. Blinds shall be continuous between jambs inside of window frame unless otherwise noted.

PART 3 – EXECUTION

3.01 INSPECTION AND PREPARATION

A. Blind subcontractor shall be responsible for inspection of site, approval of mounting surfaces, installation conditions and field measurements for this work.

3.02 INSTALLATION

A. Installation shall comply with manufacturer's recommendations.

3.03 CLEANING

A. Clean finished installation of dirt and marks as recommended and approved by the manufacturer.

B. Leave work area clean and free of debris.

END OF SECTION

SECTION 12 2400
WINDOW SHADES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Window shades and accessories.

B. Electric motor operators.

C. Motor controls.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.

1.03 REFERENCE STANDARDS

A. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2015.

B. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

C. WCMA A100.1 - Safety of Window Covering Products; 2022.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week prior to commencing work related to products of this section; require attendance of all affected installers.

B. Sequencing:
   1. Do not fabricate shades until field dimensions for each opening have been taken.
   2. Do not install shades until final surface finishes and painting are complete.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.
   1. Motorized Shades: Include power requirements and standard wiring diagrams.

C. Shop Drawings: Include shade schedule indicating size, location and keys to details, head, jamb and sill details, mounting dimension requirements for each product and condition, and operation direction.

D. Certificates: Manufacturer's documentation that line voltage components are UL listed or UL recognized.

E. Source Quality Control Submittals: Provide test reports indicating compliance with specified fabric properties.

F. Selection Samples: Include fabric samples in full range of available colors and patterns.

G. Verification Samples: Minimum size 6 inches square, representing actual materials, color and pattern.

H. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.

I. Project Record Documents: Record actual locations of control systems and show interconnecting wiring.

J. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of shop drawings.

K. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

B. Installer Qualifications: Company specializing in performing work of this type with minimum five years of documented experience.
   1. Factory training and demonstrated experience.

1.07 MOCK-UP

A. Mock-Up: Provide full size mock-up of window shade complete with selected shade fabric including sample of seam when applicable.
   1. Obtain Architect's approval of light and privacy characteristics of fabric prior to fabrication.
   2. Full-sized mock-up may become part of the final installation.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.

B. Handle and store shades in accordance with manufacturer's recommendations.

1.09 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.10 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide manufacturer's warranty from Date of Substantial Completion, covering the following:
   1. Roller Shade Hardware, Chain and Shadecloth: Manufacturer's standard non-depreciating twenty-five year limited warranty.
   2. Roller Shade Motors and Motor Control Systems: Manufacturer's standard non-depreciating five-year warranty.
   3. Roller Shade Installation: One year from date of Substantial Completion, not including scaffolding, lifts or other means to reach inaccessible areas.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manually Operated Roller Shades:
   1. MechoShade System, Inc.: www.mechoshade.com
   2. Draper, Inc: www.draperinc.com/sle.
   3. Lutron Electronics Co., Inc: www.lutron.com/sle.
   4. Hunter Douglas Architectural: www.hunterdouglasarchitectural.com/#sle.
   5. Levolor: www.levolor.com/commercial/#sle.
   6. Hunter Douglas: www.hunterdouglas.com.
   7. SWFcontract, a division of Springs Window Fashions, LLC.: www.swfcontract.com.
   8. Substitutions: See Section 01 6000 - Product Requirements.

B. Motorized Roller Shades, Motors and Motor Controls:
   1. MechoShade System, Inc.: www.mechoshade.com
   2. Draper, Inc: www.draperinc.com/sle.
   3. Hunter Douglas: www.hunterdouglas.com.
   4. Lutron Electronics Co., Inc: www.lutron.com.
   5. Hunter Douglas Architectural: www.hunterdouglasarchitectural.com/#sle.
   6. Levolor: www.levolor.com/commercial/#sle.

7. SWFcontract, a division of Springs Window Fashions, LLC.: www.swfcontract.com.
8. Substitutions: See Section 01 6000 - Product Requirements.

C. Basis of Design: Motorized Shade System
1. MechoShade System, Inc.: Electro Shade System, Electro/2

D. Basis of Design: Manual Shade System
1. MechoShade System, Inc.: Mecho/5 System

E. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

2.02 WINDOW SHADE APPLICATIONS

A. Shades: Translucent or Blackout as indicated on the drawings.
1. Type: Roller shades.
a. Fabric: Refer to Schedule of Materials and Colors.
2. Color: Refer to Schedule of Materials and Colors.
3. Mounting: Inside (between jambs).
4. Operation: Manual and motorized, in locations indicated.

2.03 ROLLER SHADES

A. Roller Shades: Fabric roller shades complete with mounting brackets, roller tubes, hembars, hardware and accessories.
1. Size: As indicated on drawings.

B. Fabric: Non-flammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.
1. Flammability: Pass NFPA 701 large and small tests.

C. Roller Tubes: As required for type of operation.
1. Size: Manufacturer's standard, selected for suitability for installation conditions, span, and weight of shades.

D. Hembars: Designed for weight requirements and adaptation to uneven surfaces, to maintain bottom of shade straight and flat.
1. Style: Full wrap fabric covered bottom bar, flat profile with closed ends.

E. Manual Operation: Clutch operated continuous loop; beaded ball chain with hold-down tension device complying with WCMA A100.1-2022.

F. Motor Operation: Motor system housed inside roller tube, controlling shade movement via motor controls indicated; listed to UL 325.
1. Audible Noise: Maximum 39 dBA measured 3 feet from the motor unit; no audible clicks when motor starts and stops.
2. Motors: Size and configuration as recommended by manufacturer for the type, size, and arrangement of shades to be operated; integrated into shade operating components and concealed from view.
3. Motor Type: AC, for direct hardwired connection to AC power source.
4. Coupling of Multiple Shades: Where possible, minimize number of motors by coupling adjacent shades.
5. Control Compatibility: Fully compatible with the controls to be installed.

2.04 MOTOR CONTROLS

A. Motorized shades to be controlled by wall-mounted controls as specified below.

B. Control Requirements:

1. Unless specifically indicated to be excluded, provide all required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system that provides the control intent indicated.
2. Capable of controlling shade speed for tracking within plus or minus 0.125 inch throughout entire travel.
3. Capable of stopping within accuracy of 0.125 inch at any point between open and close limits.
4. Capable of assigning shades to groups and subgroups without rewiring.
5. Capable of storing programmable stop points, including open, close, and any other position.
6. Provide power failure memory for preset stops, open and close limits, shade grouping and subgrouping and system configuration.
7. Capable of synchronizing multiple units of the same size to start, stop and move in unison.
8. Provide all components and connections necessary to interface with other systems as indicated.

C. Wall-Mounted Controls: UV stabilized visible parts provided by shade manufacturer.

2.05 ACCESSORIES

A. Fascias: Size as required to conceal shade mounting.
   1. Style: As selected by Architect from shade manufacturer's full selection.
   2. Material and Color: To match shade.

B. Brackets and Mounting Hardware: As recommended by manufacturer for mounting configuration and span indicated.

C. Fasteners: Non-corrosive, and as recommended by shade manufacturer.

2.06 FABRICATION

A. Field measure finished openings prior to ordering or fabrication.

B. Fabricate shades to fit openings within specified tolerances.
   1. Vertical Dimensions: Fill openings from head to sill with 1/2 inch space between bottom bar and window sill.
   2. Horizontal Dimensions - Inside Mounting: Fill openings from jamb to jamb.

C. Dimensional Tolerances: As recommended in writing by manufacturer.

D. At openings requiring continuous multiple shade units with separate rollers, locate roller joints at window mullion centers; butt rollers end-to-end.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine finished openings for deficiencies that may preclude satisfactory installation.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Start of installation shall be considered acceptance of substrates.

3.02 PREPARATION

A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.

B. Coordinate with window installation and placement of concealed blocking to support shades.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.

B. Installation Tolerances:
   1. Inside Mounting: Maximum space between shade and jamb when closed of 1/16 inch.
   2. Maximum Offset From Level: 1/16 inch.

C. Replace shades that exceed specified dimensional tolerances at no extra cost to Owner.

D. Adjust level, projection and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.04 CLEANING

A. Clean soiled shades and exposed components as recommended by manufacturer.

B. Replace shades that cannot be cleaned to "like new" condition.

3.05 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. See Section 01 7900 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate operation and maintenance of window shade system to Owner's personnel.

3.06 PROTECTION

A. Protect installed products from subsequent construction operations.

B. Touch-up, repair or replace damaged products before Substantial Completion.

3.07 MAINTENANCE

A. See Section 01 7000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

END OF SECTION

SECTION 12 3200
MANUFACTURED WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured custom plastic-laminate-faced casework, with cabinet hardware.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Blocking and nailers for anchoring casework.

B. Section 07 9200 - Joint Sealants: Sealing joints between casework and countertops and adjacent walls, floors, and ceilings.

C. Section 08 8000 - Glazing: Methods for shop-glazing of casework.

D. Section 12 3600 - Countertops: Additional requirements for countertops.

1.03 DEFINITIONS

A. Exposed: Portions of casework visible when drawers and cabinet doors are closed, including end panels, bottoms of cases more than 42 inches above finished floor, tops of cases less than 72 inches above finished floor and all members visible in open cases or behind glass doors.

B. Semi-Exposed: Portions of casework and surfaces behind solid doors, tops of cases more than 72 inches above finished floor and bottoms of cabinets more than 30 inches but less than 42 inches above finished floor.

C. Concealed: Sleepers, web frames, dust panels and other surfaces not generally visible after installation and cabinets less than 30 inches above finished floor.

1.04 REFERENCE STANDARDS

A. ANSI A135.4 - Basic Hardboard; 2012 (Reaffirmed 2020).

B. ANSI/AWI 0641 - Architectural Wood Casework Standard; 2019.

C. ASTM C1036 - Standard Specification for Flat Glass; 2021.

D. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

E. BHMA A156.9 - Cabinet Hardware; 2020.

F. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting at least one week prior to the start of the work of this section; require attendance by all affected installers.

B. Keying Conference: Conduct conference prior to ordering keys. Incorporate conference decisions into keying submittal.

1.06 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Component dimensions, configurations, construction details, joint details, attachments and hardware.

C. Shop Drawings: Indicate casework types, sizes, and locations, using large scale plans, elevations, and cross sections. Include rough-in and anchors, reinforcements, and blocking, placement dimensions and tolerances, clearances required, and keying information.

D. Samples for Finish Selection: Fully finished, for color selection. Minimum sample size: 6 inches by 6 inches or as indicated.
   1. Plastic laminate samples, for color, texture, and finish selection, size 6 inches by 6 inches.

E. Samples for Hardware Selection: Submit actual sample items of proposed pulls, hinges, shelf standards, and locksets, demonstrating hardware design, quality, and finish.

F. Manufacturer's Qualification Statement.

G. Installer's Qualification Statement.

H. Maintenance Data: Manufacturer's recommendations for care and cleaning.

I. Finish touch-up kit for each type and color of materials provided.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience and one project within the last five years with a value of woodwork within 20 percent of cost of woodwork for this project.

B. Perform cabinet construction in accordance with ANSI/AWI 0641 - Architectural Woodwork Standards.

C. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than five years of documented experience and approved by manufacturer.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Protect items provided by this section, including finished surfaces and hardware items during handling and installation. For metal surfaces, use polyethylene film or other protective material standard with the manufacturer.

B. Acceptance at Site:
   1. Do not deliver or install casework until the conditions specified under Part 3, Examination Article of this section have been met. Products delivered to sites that are not enclosed and/or improperly conditioned will not be accepted if warping or damage due to unsatisfactory conditions occurs.

C. Storage:
   1. Store casework in the area of installation. If necessary, prior to installation, temporarily store in another area, meeting the environmental requirements specified under Part 3, "Site Verification of Conditions" Article of this section.

1.09 MOCK-UPS

A. Provide full size base cabinet, upper cabinet, and tall cabinet complete with drawers, door, adjustable shelf and countertop of every finish type.

B. See Section 01 4000 - Quality Requirements for additional requirements.

C. Locate where directed by the Architect.

D. Mock-up may remain as part of the work.

1.10 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a two year period after Date of Substantial Completion, at no additional cost to Owner. Defects include, but are not limited to:
   1. Ruptured, cracked, or stained finish coating.
   2. Discoloration or lack of finish integrity.
   3. Cracking or peeling of finish.
   4. Delamination of components.
   5. Failure of adhesives.
   6. Failure of hardware.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturer shall be members in good standing of the Architectural Woodwork Institute (AWI).

B. Obtain casework from single source and manufacturer, unless otherwise indicated.

2.02 CASEWORK, GENERAL

A. Quality Standard: ANSI/AWI 0641 - Architectural Woodwork Standards; 2019.

B. Types: When more than one type is required, see drawings for location of each type of casework.

C. Plastic Laminate Faced Cabinets: Custom Grade.

D. Desks and Display Cases - Premium Grade

E. Refer to 01 6210- Schedule of Materials and Colors and Drawings for additional casework details.

2.03 LUMBER MATERIALS

A. Hardwood Lumber: NHLA; Graded in accordance with ANSI/AWI 0641, Grade II/Custom; average moisture content of 6-8 percent; species as scheduled.

B. Solid Lumber: Any Species, with no defects affecting strength or utility.

2.04 PANEL MATERIALS

A. Plastic-laminate-faced Plywood for Non-Decorative Purposes: NIST PS 1, Interior rated adhesives, core of wood plies from any species suitable for intended use unless otherwise indicated, thickness as indicated or as required by application.
   1. Provide 1" thick shelves at storage/book rooms.
   2. Provide 1" thick shelves when length is 36" or longer.

B. Hardboard: AHA A135.4; Pressed wood fiber with resin binder, Class 1 - Tempered, 1/4 inch thick, smooth one side for horizontal applications, smooth two sides (S2S) for vertical applications; use for drawer bottoms, dust panels, vertical slot dividers, and other components indicated on drawings.

2.05 FABRICATION

A. Assembly: Shop assemble casework items for delivery to site in units easily handled and to permit passage through building openings.

B. Construction: As required for selected grade.

C. Cabinet support bases shall be fabricated from solid 2x4 lumber. No particleboard, wafer board or legs allowed.

D. Provide treated wood in all wet areas

E. Fabricate all drawers boxes using 1/2" inch, 9-ply laminated hardwood plywood. The top edges of the drawer box sides and back are radiused. Drawer bottom is let in on four sides, and securely glued underneath with a continuous bead of glue around the perimeter of the drawer bottom. Additional bottom braces are used on drawers over 24" wide. All components have one coat of clear waterproof sealer. Drawer boxes are screw-attached to separate drawer fronts.

F. Glazing for Doors: 1/4 inch Clear tempered glass.

G. Fittings and Fixture Locations: Cut and drill components for fittings and fixtures.

H. Hardware Application: Factory-machine casework members for hardware that is not surface applied.

I. Access Panels: Where indicated, for maintenance of utility service and mechanical and electrical components.

J. Removable back panels on indicated base cabinets. Provide partial height back panels at sink cabinets.

K. Fixed panels at backs of open spaces between base cabinets.
   1. Provide cutouts for power and data receptacles where indicated on drawings.

L. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

M. Scribes and Fillers: Panels of matching construction and finish, for locations where cabinets do not fit tight to adjacent construction.

N. Apron Frames: Construction similar to other cabinets, with modifications.
   1. Frames fabricated from panels standard with the manufacturer. Include front and back panels, with drawer suspension framing mechanically fastened to support channels spanning between them.
   2. Apron Drawers: Manufacturer's standard drawer construction and size for apron installation. Single drawer for aprons up to 36 inches wide maximum, two drawers for wider aprons.

O. Countertop Panel-Type Supports: Materials similar to adjacent casework, 1-1/2 inch in width, with front-to-back and toe space dimensions matching base cabinet. Designed to be secured in a concealed fashion to countertop material. Include two leveling devices per support panel.

P. Countertop Metal Supports: Hidden metal support brackets of size and configuration as required for support of countertops depth as detailed in the drawings.
   1. Manufactures:
      a. Centerline Brackets: www.countertopbracket.com
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.06 PLASTIC-LAMINATE-CLAD CASEWORK

A. Plastic-Laminate-Clad Casework: Solid wood and wood panel construction; each unit self-contained and not dependent on adjacent units or building structure for rigidity; in sizes necessary to avoid field cutting except for scribes and filler panels. Include adjustable levelers for base and tall cabinets.
   1. Style: Flush overlay. Ease doors and drawer fronts slightly at edges.
   2. Cabinet Nominal Dimensions: Unless otherwise indicated, provide cabinets of widths and heights indicated on drawings, and with following front-to-back dimensions:
      a. Base Cabinets: 24 inches.
      b. Tall Cabinets: 24 inches.
      c. Wall Cabinets: 14 inches.
   3. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline.
      a. See Schedule of Materials and Colors for products Basis of Design and additional information.
      b. Finish: Matte or suede, gloss rating of 5 to 20.
      c. Surface Color and Pattern: As scheduled.
      d. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
      e. No melamine is allowed.
      f. Cap exposed plastic laminate finish edges with plastic trim.
         1) All doors, drawers, shelves and counter tops must be edged with 3mm PVC applied with hot melt adhesive and radiuses with automatic trimmers. Hand applied or field applied and trimmed is not acceptable. Provide PVC edge on front edge of fixed shelves and all 4 edges of adjustable shelves.

B. File cabinets: Top of drawer sides shall be fitted with a full-length molded plastic or metal rail to fit hanging folders.

C. Casework is not allowed on the site until the building is completely dried in and climate-controlled, with the humidity less than 60% and the temperature controlled between 65 and 80°F. The HVAC system must be operational before casework is allowed on the site.

2.07 COUNTERTOPS

A. Countertops: See Section 12 3600.

2.08 CABINET HARDWARE

A. Manufacturer's standard types, styles and finishes, and as indicated below.

B. Comply with BHMA A156.9 requirements.

C. Locks: Provide locks on casework drawers and doors where indicated. Comply with BHMA A156.11, Grade 1..
   1. Cam Locks:
      a. C415A Cam Locks.
      b. Substitutions: See Section 01 6000 - Product Requirements.
   2. Elbow Catches (Inactive Doors):
      a. EC-2-26D
      b. Substitutions: See Section 01 6000 - Product Requirements.
   3. Coordinate keying with Owner.
   4. Keying: Key Key all cabinets in entire building with same TISD standard casework key.

D. Shelves in Cabinets:
   1. Shelf Standards and Rests: 4 Standards (K & V)#255, 4 Brackets/Shelf(K & V)#256.

E. Swinging Doors: Hinges, pulls, and catches.
   1. Hinges: Semi-Concelaed, number as required by referenced standards for width, height, and weight of door.
      a. Semi-Concealed Hinges: Installed as required by hinge design, satin chromium plated over nickel on base material.
         1) Institutional Hinge, 100742, Dull Chrome (Cabinetmakers Hardware, 2002, Volume 6B), or approved equivalent. Hinge count, spacing and layout to be determined as required.
   2. Pulls: Satin Chrome wire pulls, 4 inches wide.
      a. Pull design to comply with project's referenced accessibility requirements.
   3. Catches: Magnetic.

F. Drawers: Pulls and slides.
   1. Pulls: Satin Chrome wire pulls, 4 inches wide (typical).
      a. Pull design to comply with project's referenced accessibility requirements.
   2. Slides: Steel, full extension arms, ball bearings; soft close,capacity as recommended by manufacturer for drawer height and width.

G. Pull-Out Keyboard Tray
   1. Each to have:(K & V)#5710

H. Clothes Rod each to have:
   1. Rod(K & V)#770 5
   2. Flange(K & V)#764 CHR

I. Adjustable Shelves at Display Cases, each to have:
   1. Standards (K & V)#87
   2. Brackets/Shelf(K & V)#186

J. Casters:
   1. Swivel-type: 4-inch diameter wheels of soft or hard rubber and self-lube wheel bearing. Swivel is double-level, hardened ball bearing. All metal surfaces are zinc-plated.

2. Rigid-type: 4-inch wheels of soft or hard rubber, held in horns of formed steel, zinc plated. Wheel spanner bushings. Load capacity is 225 pounds per caster. Brake available on both swivel and rigid.

2.09 MATERIALS

A. Wood-Based Materials:
   1. Solid Wood: Air-dried to 4.5 percent moisture content, then tempered to 6 percent moisture content before use.
   2. Composite Wood Panels: Containing no urea-formaldehyde resin binders.

B. Concealed Solid Wood or Plywood: Any species and without defects affecting strength or utility.

C. Hardboard: ANSI A135.4, Class 1, tempered.

D. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications. complying with Grade requirements, and standard with the manufacturer.
   1. Provide specific types as follows:
      a. Horizontal Surfaces: HGS, 0.048 inch nominal thickness, colors as scheduled, .
      b. Vertical Surfaces: VGS, 0.028 inch nominal thickness, colors as scheduled, .
      c. Post-Formed Horizontal Surfaces: HGP, 0.039 inch nominal thickness, colors as scheduled, .
      d. Post-Formed Vertical Surfaces: VGP, 0.028 inch nominal thickness, colors as scheduled, .
      e. Flame Retardant Surfaces: HGF, 0.048 inch nominal thickness, colors as scheduled, .
      f. Cabinet Liner: CLS, 0.020 inch nominal thickness, colors as scheduled, .
      g. Laminate Backer: BKL, 0.020 inch nominal thickness, undecorated; for application to concealed backside of panels faced with high pressure decorative laminate.

E. Glass: Fully tempered float; ASTM C1036, Type 1, Quality Q3; ASTM C1048, tempered using horizontal tempering; 1/4 inch thick minimum; clear.

2.10 ACCESSORIES

A. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.

B. Concealed Joint Fasteners: Corrosion-resistant, standard with manufacturer.

C. Grommets: Standard plastic or rubber grommets for cut-outs, in color to match adjacent surface.

D. Sealant for Use in Casework Installation:
   1. Manufacturer's recommended type.

E. Concealed Fastening Clips: Provide for accessible panels and other areas indicated on the drawings.

F. Cable Management Tray: Size and configuration required for application.

G. Door/Drawer Silencers: 2 per door/drawer minimum, 3 for door/drawers over 48 inches.

PART 3 EXECUTION

3.01 PREPARATION

A. Large Components: Ensure that large components can be moved into final position without damage to other construction.

3.02 EXAMINATION

A. Site Verification of Environmental Conditions:

1. Do not deliver casework until the following conditions have been met:
   a. Building has been enclosed (windows and doors sealed and weather-tight).
   b. An operational HVAC system that maintains temperature and humidity at occupancy levels has been put in place.
   c. Ceiling, overhead ductwork, piping, and lighting have been installed.
   d. Installation areas do not require further “wet work” construction.

B. For Base Cabinets Installation: Examine floor levelness and flatness of installation space. Do not proceed with installation if encountered floor conditions required more than 1/2 inch leveling adjustment. When installation conditions are acceptable, for each space, establish the high point of the floor. Set and make level and plumb first cabinet in relation to this high point.

C. For Wall Cabinets Installation: Examine wall surfaces in installation space. Do not proceed with installation if the following conditions are encountered:
   1. Maximum variation from plane of masonry wall exceeds 1/4 inch in 10 ft and 1/2 inch in 20 ft or more, and/or maximum variation from plumb exceeds 1/4 inchper story.
   2. Maximum Variation of finished gypsum board surface from true flatness: 1/8 inch in 10 feet in any direction.

D. Verify adequacy of support framing and anchors.

E. Verify that service connections are correctly located and of proper characteristics.

3.03 INSTALLATION

A. Perform installation in accordance with manufacturer's instructions.

B. Use anchoring devices to suit conditions and substrate materials encountered. Use concealed fasteners to the greatest degree possible. Use exposed fasteners only where allowed by approved shop drawings, or where concealed fasteners are impracticable.

C. Set casework items plumb and square, securely anchored to building structure.

D. Align cabinets to adjoining components, install filler and/or scribe panels where necessary to close gaps.

E. Fasten together cabinets in continuous runs, with joints flush, uniform and tight. Misalignment of adjacent units not to exceed 1/16 inch. In addition, do not exceed the following tolerances:
   1. Variation of Tops of Base Cabinets from Level: 1/16 inch in 10 feet.
   2. Variation of Bottoms of Wall Cabinets from Level: 1/8 inch in 10 feet.
   3. Variation of Faces of Cabinets from a True Plane: 1/8 inch in 10 feet.
   4. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch.
   5. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch.

F. Secure wall and floor cabinets to concealed reinforcement and blocking at gypsum board assemblies.

G. Base Cabinets: Fasten cabinets to service space framing and/or wall substrates, with fasteners spaced not more than 16 inches on center. Bolt adjacent cabinets together with joints flush, tight, and uniform.
   1. Where base cabinets are installed away from walls or service space framing, anchor to floor at toe space at not more than 24 inches on center, and at sides of cabinets with not less than two fasteners per side.

H. Wall Cabinets: Fasten to hanging strips, and/or wall substrates. Fasten each cabinet through back, near top, at not less than 16 inches on center.

I. Install hardware uniformly and precisely.

J. Countertops: Install countertops intended and furnished for field installation in one true plane, with ends abutting at hairline joints, and no raised edges.

K. Replace units that are damaged, including those that have damaged finishes.

3.04 ADJUSTING

A. Adjust operating parts, including doors, drawers, hardware, and fixtures to function smoothly.

3.05 CLEANING

A. Clean casework and other installed surfaces thoroughly.

3.06 PROTECTION

A. Do not permit finished casework to be exposed to continued construction activity.

B. Protect casework and countertops from ongoing construction activities. Prevent workmen from standing on, or storing tools and materials on casework or countertops.

C. Repair damage, including to finishes, that occurs prior to Date of Substantial Completion, using methods prescribed by manufacturer; replace units that cannot be repaired to like-new condition.

END OF SECTION

SECTION 12 3551
MUSIC INSTRUMENT STORAGE CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Music Instrument Storage Casework

1.02 RELATED REQUIREMENTS

A. General and Supplementary Conditions of the Contract, Division 1 General Requirements, and Drawings are applicable to this Section.

B. Division 06 Section "Rough Carpentry" for blocking in frame walls required to anchor casework.

1.03 REFERENCES

A. American National Standards Institute (ANSI):
   1. ANSI A208.1 – Particleboard.

B. American Society of Civil Engineers (ASCE):
   1. ASCE 7 – Minimum Design Loads for Buildings and Other Structures.

C. ASTM International (ASTM):
   1. ASTM C 423 – Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
   2. ASTM E 488 – Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements.
   3. ASTM E 795 – Standard Practices for Mounting Test Specimens During Sound Absorption Tests.

D. GREENGUARD Environmental Institute (GEI):
   1. GREENGUARD certified low emitting products.

E. Audio Engineering Society (AES):
   1. AES-4id – AES information document for room acoustics and sound reinforcement systems -- Characterization and measurement of surface scattering uniformity.

F. Builders Hardware Manufacturers Association (BHMA):
   1. ANSI/BHMA A156.9 – Cabinet Hardware.

G. National Electrical Manufacturers Association (NEMA):
   1. NEMA LD 3 – High Pressure Decorative Laminates.

H. U.S. Department of Commerce, National Institute of Standards and Technology (NIST):
   1. DOC PS 1 – U.S. Product Standard for Construction and Industrial Plywood.

I. California Air Resources Board (CARB).

J. California 93120 – Formaldehyde Emissions Phase I.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer’s data sheets, installation instructions, and maintenance recommendations.

C. Shop Drawings: Prepared by manufacturer. Include elevations showing casework components, details of each condition of installation, and types and locations of hardware and fasteners. Show fabrication and installation details. Include plans, elevations, sections, details, and attachments to other Work.

D. Samples: For each color and finish for each exposed casework component.

E. Operation and Maintenance Data.

F. Warranty: Submit sample meeting warranty requirements of this Section.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Approved manufacturer listed in this section, with minimum 5 years experience in manufacture of similar products in use in similar environments. Obtain music education storage casework through one source from a single approved manufacturer.
   1. Approval of Comparable Products: Submit the following in accordance with project substitution requirements, within time period allowed for substitution review:
      a. Product data, including certified independent test data indicating compliance with requirements for acoustical performance.
      b. Samples of each type of product specified, including but not limited to the following:
         1) Schedule 1 Door and casework panels.
         2) Schedule 2 Grille doors.
         3) Schedule 3 Hinges with through-bolting hardware.
         4) Schedule 4 Latches with through-bolting hardware.
      c. Project references: minimum of 5 installations not less than 5 years old, with owner contact information.
      d. List of successful installations of similar products available for evaluation by Architect.
      e. Sample warranty.
   2. Submit substitution request not less than 15 days prior to bid date. Substitutions following award of contract are not allowed except as stipulated in Division 01 General Requirements.
   3. Approved manufacturers must meet separate requirements of Submittals Article.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle music education storage casework in accordance with manufacturer’s recommendations. Ship to jobsite only after roughing-in, painting work, and other related finish work has been completed and installation areas are ready to accept casework and recommended temperature and humidity levels will be maintained during the remainder of construction.

1.07 COORDINATION

A. Coordinate installation of blocking and supports in frame wall assemblies under work of other sections where required for anchoring of music education storage casework.

B. Project Environmental Requirements
   1. Comply with requirements of referenced standards and recommendations of material manufacturers for environmental conditions before, during, and after installation.
   2. Do not begin installation until building is completely enclosed and HVAC system is operating and maintaining temperature and humidity conditions consistent with "after occupancy" conditions for a minimum of 2 weeks.
   3. Maintain continuous and uniform building temperatures of not less than 50 degrees F during installation nor more than 85 degrees F.
   4. Environmental Requirements: Do not install cabinets until all mortar, wet and dust producing work is completed.
   5. Field Measurements: Obtain required field measurements from the Contractor and indicate on Shop Drawings.

1.08 WARRANTY

A. Special Warranty: Manufacturer's written warranty indicating manufacturer’s intent to repair or replace components of music education storage casework that fail in materials or workmanship within 10 years from date of Substantial Completion. Failures are defined to include, but are not limited to, the following:
   1. Fracturing or breaking of casework components including doors, panels, shelves, or hardware resulting from normal wear and tear and normal use other than vandalism.

2. Delamination or other failures of glue bond of components.
3. Warping of casework components not resulting from leaks, flooding, or other uncontrolled moisture or humidity.
4. Failure of operating hardware.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. MARCO: www.madebymarco.net

B. Substitutions: See Section 01 6000 - Product Requirements.

2.02 CABINET SYSTEM

A. System Description:
   1. Modular instrument storage casework with integral bases, adjustable levelers, and through-bolted fastening, enabling owner reconfiguration of unit layout.

B. Performance Requirements:
   1. Storage Casework Component Load Capacities:
      a. Storage Casework Door Hinge: Each weld capable of resisting 400 lbf (1779 N) pull test without visible damage or permanent deformation.

2.03 MATERIALS

A. Particleboard: ANSI A208.1, minimum 45 lb/cu. ft. (721 kg/cu. m) density.

B. Particleboard Thermoset Panels: Particleboard finished with thermally-fused polyester surfacing on both sides meeting performance properties of NEMA LD 3 for VGS grade, edge-banded, including the following:
   1. Surface Abrasion Resistance: Taber Wheel, 400 cycles, for solid colors.

C. Polyethylene Shelves: High-density, one-piece, blow-molded or polyethylene, with radiused front edge, for abuse-resistant shelves.

D. PVC Edge Banding: Radiused PVC extrusions, 3 mm thick.

2.04 INSTRUMENT STORAGE CASEWORK

A. General: Provide through-ventilating instrument storage casework meeting requirements in System Description and Performance Requirements Articles.

B. Side Panels and Divider Panels: Particleboard thermoset panel with no urea formaldehyde added, 3/4 inch (19 mm) thick. Side panels machined to accept unit-to-unit through-bolting.

C. Panel Edge Banding: 3 mm thick, heat-bonded, with radiused and profiled edges and corners.

D. Grille Doors: Bright basic steel wire, 5/16 and 3/16 inch (7.9 and 4.8 mm) diameter, or 5/16 and 1/4 inch (7.9 and 6.3 mm) diameter for AcoustiCabinets, with full 360 degree welds at T-joints.
   1. Provide for Instrument Storage Casework

E. Panel Edge Banding: 3 mm thick, heat-bonded, with radiused and profiled edges and corners.

F. Shelving: Sized with adequate gap between shelving and casework side panels to allow air movement inside casework.
   1. Up to 27 inches (686 mm) wide: Removable molded polyethylene shelf, with impact-resistant, radiused front edge, mounted to cabinet wall with self-locking clip.
   2. Over 27 inches (686 mm) wide: For large instrument casework: Removable formed polyethylene shelf, ribbed, with high-impact-resistant, radiused front edge, supported by steel tube frame.
   3. Corner cabinet revolving shelving: 0.053 inch (1.3 mm) min. thickness steel sheet bolted to revolving steel center post, with radiused hardboard deflector panel.

G. Casework Panel Color: As selected by Architect from manufacturer's standard colors.

2.05 ACCESSORIES

A. Filler Panels and Closure Kits: 3/4 inch (19 mm) thick particleboard thermoset panels with no urea formaldehyde added matching cabinet side panels. Provide the following, cut to fit field conditions, where indicated:
   1. Wall filler between cabinet side and wall.
   2. Top filler between cabinet top and wall.
   3. Top of cabinet closure panel between cabinet and finished ceiling or soffits.
   4. Finished back panel for exposed cabinet backs.

2.06 HARDWARE

A. Butt Hinges: 2-3/4 inch (70 mm), 5-knuckle steel hinges made from 0.090 inch (2.29 mm) thick metal, ANSI/BHMA A156.9, Grade 1, with powder-coated finish, through-bolted to door and side panels and welded to grille door frames. Provide 2 hinges on compartment doors, and 4 hinges on full-height doors.

B. Slide Latch: 0.105 inch (2.67 mm) min. thickness steel, with padlock eye, powder-coat finish, through-bolted to panel door and side panel and welded to grille door frames. Latches securely without padlock. Provide with clear plastic label holder with numbering system. Padlocks furnished by Owner.

C. Panel Connectors: 1/4-20 by 1.77 inch (45 mm) panel connectors, with steel thread inserts, powder coated to match panels.

D. Cabinet Levelers: Leveling glides with 3/8 inch (9.5 mm) diameter threaded steel rod in steel corner brackets, minimum two each per cabinet side, accessible from within unit, and concealed in completed installation.

E. Fasteners: Manufacturer-recommended fasteners as required for casework substrate and project performance requirements, consisting of one or more of the following:
   1. Sheet Metal Screws: SAE J78, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.
   2. Wood Screws: ASME B18.6.1.
   3. Expansion Anchors in Concrete and Concrete Masonry Units: Carbon-steel, zinc plated.

2.07 FINISHES

A. Steel Sheet, Steel Wire, and Exposed Fasteners: Urethane-based electrostatic powder coating, color as indicated.

B. Refer to Section 01 6210 - Schedule of Materials and Colors for approved color selection.

PART 3 EXECUTION

3.01 PREPARATION

A. Examine casework installation areas for compliance with requirements for installation tolerances, location of blocking and other anchoring reinforcements, and other existing conditions affecting installation and performance of casework. Proceed with casework installation upon correction of unsatisfactory conditions.

3.02 CASEWORK INSTALLATION

A. Install plumb, level, and true; using integral levelers. Install in accordance with manufacturer’s recommendations and approved submittals.

B. Install hardware uniformly and precisely. Set hinges snug and flat. Adjust and align hardware so moving parts operate freely and contact points meet accurately. Allow for final adjustment after installation.

C. Adjust casework and hardware so doors and drawers operate smoothly without warp or bind and close with uniform reveals.

3.03 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

3.04 CLEANING

A. Clean casework surfaces. Touch up, refinish, or replace damaged components in a manner acceptable to Architect.

3.05 PROTECTION

A. Protect work so that it will be without any evidence of damage or use at time of acceptance.

B. Repair or replace defective work as directed by Architect upon inspection.

C. Turn over operation and maintenance instructions to Owner.

END OF SECTION

SECTION 12 3600
COUNTERTOPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Countertops for manufactured casework.
   1. Plastic Laminate Countertops.
   2. Solid Surfacing Countertops, Sills and where called out on the drawings.
   3. Natural Quartz Countertops.

1.02 RELATED REQUIREMENTS

A. Section .

1.03 REFERENCE STANDARDS

A. ANSI/AWI 0641 - Architectural Wood Casework Standard; 2019.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023.

C. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.

D. ISFA 3-01 - Classification and Standards for Quartz Surfacing Material; 2013.

E. MIA (DSDM) - Dimensional Stone Design Manual, Version VIII; 2016.

F. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

G. PS 1 - Structural Plywood; 2019.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Specimen warranty.

C. Shop Drawings: Complete details of materials and installation and countertop seaming ; combine with shop drawings of cabinets and casework specified in other sections.

D. Verification Samples: For each finish product specified, minimum size 6 inches square, representing actual product, color, and patterns.

E. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.05 MOCK-UPS

A. Provide as part of casework specified in 12 3200-Manufactured Wood Casework.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience and approved by manufacturer.

B. Perform cabinet construction in accordance with ANSI/AWI 0641 - Architectural Woodwork Standards.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.08 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 COUNTERTOPS

A. Quality Standard: See Section 12 3200.

B. Plastic Laminate Countertops: High-pressure decorative laminate (HPDL) sheet bonded to substrate.
   1. Laminate Sheet: NEMA LD 3, Grade HGS, 0.048 inch nominal thickness.
      a. Manufacturers:
         1) Arborite: www.arborite.com/#sle.
         2) Formica Corporation: www.formica.com/#sle.
         3) Lamin-Art, Inc: www.laminart.com/#sle.
         4) Panolam Industries International, Inc\Nevamar: www.nevamar.com.
         5) Panolam Industries International, Inc\Pionite: www.pionite.com.
         6) Wilsonart: www.wilsonart.com/#sle.
         7) Substitutions: See Section 01 6000 - Product Requirements.
      b. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
      c. NSF approved for food contact.
      d. Wear Resistance: In addition to specified grade, comply with NEMA LD 3 High Wear Grade requirements for wear resistance.
      e. Finish: Matte or suede, gloss rating of 5 to 20 or as scheduled in the Schedule of Materials and Colors.
      f. Surface Color and Pattern: See Drawings and Section 01 6210 - Schedule of Materials and Colors.
   2. Exposed Edge Treatment: 3 mm Molded PVC edge with T-spline, sized to completely cover edge of panel.
      a. Color: Color match to face laminate.
   3. Back and End Splashes: Same material, same construction.
   4. Fabricate in accordance with manufacturer's standard requirements.

C. Solid Surfacing Countertops, Sills and where called out on the drawings: Solid surfacing sheet or plastic resin casting self-supporting over structural members.
   1. Flat Sheet Thickness: 1/2 inch, minimum.
   2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
      a. Manufacturers:
         1) Avonite Surfaces: www.avonitesurfaces.com/#sle.
         2) Dupont: www.corian.com/#sle.
         3) Formica Corporation: www.formica.com/#sle.
         4) Meganite, Inc: www.meganite.com/#sle.
         5) Relang International, LLC: www.duraseinusa.com/#sle.
         6) Wilsonart: www.wilsonart.com/#sle.
         7) Substitutions: See Section 01 6000 - Product Requirements.
      b. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
      c. NSF approved for food contact.

d. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20or as scheduled in the Schedule of Materials and Colors.
e. Color and Pattern: As Scheduled.

3. Exposed Edge Treatment: Built up to minimum 1-1/4 inch thick; square edge.
4. Back and End Splashes: Same sheet material, 1/2 inch thick maximum, square top; minimum 4 inches high.
5. Fabricate in accordance with manufacturer's standard requirements.

D. Natural Quartz and Resin Composite Countertops: Sheet or slab of natural quartz and plastic resin self-supporting over structural members.
1. Flat Sheet Thickness: 3/4 inch, minimum.
2. Natural Quartz and Resin Composite Sheets, Slabs and Castings: Complying with ISFA 3-01 and NEMA LD 3; orthophthalic polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
a. Manufacturers:
1) Cambria Company LLC: www.cambriausa.com/#sle.
2) Dal-Tile Corporation: www.daltile.com/#sle.
3) Terrazzo & Marble Supply Companies: www.tmsupply.com/#sle.
4) Dupont: www.corian.com/#sle.
5) Wilsonart: www.wilsonart.com/#sle.
6) Substitutions: See Section 01 6000 - Product Requirements.
b. Factory fabricate components to the greatest extent practical in sizes and shapes indicated; comply with the MIA Dimension Stone Design Manual.
c. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
d. NSF approved for food contact.
e. Finish on Exposed Surfaces: See Drawings and Section 01 6210 - Schedule of Materials and Colors.
f. Color and Pattern: As Scheduled.
3. Exposed Edge Treatment: Built up to minimum 1-1/4 inch thick; square edge.
4. Back and End Splashes: Same sheet material, 1/2 inch thick maximum, square top; minimum 4 inches high.
5. Fabricate in accordance with manufacturer's standard requirements.

2.02 MATERIALS

A. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch thick; join lengths using metal splines.

B. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

C. Joint Sealant: Mildew-resistant silicone sealant, color to match counter.

2.03 FABRICATION

A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
1. Join lengths of tops using best method recommended by manufacturer.
a. No splices on countertop plastic laminate material less than 144" will be permitted.
2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.

B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated on drawings.

1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
2. Height: 4 inches, unless otherwise indicated.

C. Solid Surfacing: Fabricate tops up to 144 inches long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.

D. Wall-Mounted Counters: Provide skirts, aprons, brackets, and braces as indicated on drawings and finished as scheduled..

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.

B. Attach plastic laminate countertops using screws with minimum penetration into substrate board of 5/8 inch.

C. Seal joint between back/end splashes and vertical surfaces.

3.04 TOLERANCES

A. Variation From Horizontal: 1/8 inch in 10 feet, maximum.

B. Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.

C. Field Joints: 1/8 inch wide, maximum.

3.05 CLEANING

A. Clean countertops surfaces thoroughly.

3.06 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 12 5219
UPHOLSTERED SEAT CUSHIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Upholstered Seat Cushions

1.02 REFERENCE STANDARDS

A. ASTM D3574 - Standard Test Methods for Flexible Cellular Materials—Slab, Bonded, and Molded Urethane Foams

B. NFPA 260 - Standard Methods of Tests and Classification System for Cigarette Ignition Resistance of Components of Upholstered Furniture

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed data sheets for products specified.

C. Shop Drawings: Fabrication and installation details, seat layout and dimensions.

D. Field Measurements: Verify seating layout by field measurements and record field dimensions on shop drawings.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver seats to project site in unopened containers clearly labeled with manufacturer's name and identification of contents.

B. Store seating units in dry and clean location until needed for installation. During installation, handle in a manner that will prevent marring and soiling of finished surfaces.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Manufacturer’s Warranty: Manufacture agrees to repair or replace components of furniture specified that fails in materials or workmanship.

C. Warranty period is one year after Subsantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fomcore: www.fomcore.com

B. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MANUFACTURED UNITS

A. Provide rectangle reading bench cushions as indicated on the drawings and as specified herein. Construction to consist of the following:
   1. No internal frame, plywood, or particle board, or base.
   2. Cushion shall sit 3” high.
   3. Cushion shall have a zippered back with zipper tucked and flipped in to sewing so students cannot unzip piece.
   4. Stitching shall be with marine grade thread

5. Stitching shall be a double stitch with a top stitch on every seam.

2.03 MATERIALS

A. Polyurethane Foam:
   1. Density: 1.45 - 1.55 lbs/ft³ per ASTM D3574
   2. IFD @ 25% Deflection 4": 50.00 - 60.00 lbs/50 in² per ASTM D3574
   3. Elongation: 100% minimum per ASTM D3574
   4. Tensile Strength: 10 lbs/in² minimum per ASTM D3574
   5. Tear Resistance: 1.00 lbs/lineal inch minimum per ASTM D3574
   6. Support Factor: 1.80 minimum
   7. Fire Retardant: Pass, per Cal 117 - Open Flame & Smolder / MVS302 / ASTM E-1353 / NFPA 260 / UL-94 HBF
   8. Anti-microbial; Yes, per Method G21, Method 30, Method 147

B. Upholstery Fabric:
   1. Material: Vinyl/Urethane Topcoat
   2. Backing: Polyester
   3. Fire Retardant: Pass, per Cal 117 - Open Flame & Smolder / NFPA 260 Class 1 / UFAC Class 1
   4. Minimum 200,000 double rub count
   5. Antibacterial, Antifungal, Stain Resistant, No Heavy Metals, Formaldehyde Free
   6. Color and Pattern: As scheduled in Section 01 6210 - Schedule of Materials and Colors

C. Stitching: Thread shall be nylon, UV resistant and color matching

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates for conditions detrimental to installation of fixed theater seating. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Comply with manufacturer's installation instructions and approved shop drawings.

B. Delivery, installation and setting-in-place shall be by a pre-arranged schedule; this schedule shall not conflict with other trades or create circumstances for merchandise to be damaged. Furnishings shall be installed only when areas involved are ready to receive them.

3.03 PROTECTION

A. Protect installed Furnishings and Upholstery from damage by work of other trades until Owner's acceptance of the work. Subcontractor to advise Interior Contractor of procedures and precautions for protection of materials and installed Furnishings and Upholstery from damage and of any required temperature/humidity conditions which must be maintained during the remainder of the construction period in areas of Furnishings and Upholstery installation.

B. Remove items damaged by failure to provide protection and/or protection information required above and replace without extra cost to Owner.

END OF SECTION

SECTION 12 9313
BICYCLE RACKS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Bicycle racks.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Mounting surface for bicycle racks.

1.03 REFERENCE STANDARDS

A. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Shop Drawings: Indicate size, shape, and dimensions, including clearances from adjacent walls, doors, and obstructions.

D. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Handle racks with sufficient care to prevent scratches and other damage to the finish.

1.06 WARRANTY

A. The contractor shall furnish a written guarantee warranting all materials, devices, and workmanship to be free of defects for a period of one year from the date of completion and acceptance. Any defects in materials, devices, and workmanship which become apparent within the guarantee period shall be repaired or replaced by the contractor at his own expense, and at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Bicycle Racks:
   1. Columbia Cascade Company: www.timberform.com.
   2. Creative Pipe, Inc: www.creativepipe.com.
   3. Highland Products Group, LLC: www.indoorbikeracks.net.
   4. Huntco Supply, LLC: www.huntco.com.
   5. Neenah Foundry, a division of Neenah Enterprises, Inc: www.nfco.com.
   6. Substitutions: See Section01 6000-Product Requirements.

2.02 BICYCLE RACKS

A. Bicycle Racks: Device allows user provided lock to simultaneously secure one wheel and part of the frame on each bicycle parked or racked.
   1. Style: Serpentine rack formed from a continuous round pipe.
   2. Capacity: 18 bicycles.
   3. Mounting, Ground: In-ground anchor
   4. Accessories: In-ground grout cover.

5. Finish: Powder coat, maintenance-free and weather-resistant
6. Color: See Schedule of Materials and Colors.

B. Materials:
1. Pipe: Carbon steel, ASTM A53/A53M, Schedule 40.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine surfaces to receive bicycle racks.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Do not begin installation until unsatisfactory substrates have been properly repaired.

3.02 PREPARATION

A. Ensure surfaces to receive bicycle racks are clean, flat, and level.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install bicycle racks level, plumb, square, and correctly located as indicated on drawings.

C. Surface Flange Installation: Anchor bicycle racks securely in place with 1/2 inch by 4 inch anchor bolts through flange holes.

3.04 CLEANING

A. Clean installed work to like-new condition. Do not use cleaning materials or methods that could damage finish.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 14 2400
HYDRAULIC ELEVATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Complete hydraulic elevator systems.
   1. Passenger type without machine room

B. Elevator Maintenance Contract.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Includes elevator pit.

B. Section 04 2000 - Unit Masonry: Masonry hoistway enclosure; building-in and grouting hoistway door frames.

C. Section 05 1200 - Structural Steel Framing: Includes hoistway framing and overhead hoist beams.

D. Section 05 5000 - Metal Fabrications: Includes sill supports, divider beams, and overhead hoist beams.

E. Section 05 5133-Metal Ladders: Includes elevator pit ladders.

F. Section 07 1300 - Sheet Waterproofing: Waterproofing of elevator pit walls and floor.

G. Section 07 8400 - Firestopping: Fire rated sealant in hoistway.

H. Section 08 7100 - Door Hardware: Product requirements for key cylinders and card readers for placement by this section.

I. Section 09 2116.23 - Gypsum Board Shaft Wall Assemblies.

J. Division 21 - Fire Suppression: Fire Sprinkler System in Hoistway

K. Division 22 - Plumbing: Motor for sump pump in pit.

L. Division 26 - Electrical: Conduit and wiring connections.

M. Division 28 - Electronic Safety and Security: Fire detection and alarm systems.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

C. AISC 360 - Specification for Structural Steel Buildings; 2016.

D. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).

E. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

F. ASME A17.1 - Safety Code for Elevators and Escalators; 2016.

G. ASME A17.2 - Guide for Inspection of Elevators, Escalators, and Moving Walks; 2014.

H. ASME QEI-1 - Standard for the Qualification of Elevator Inspectors; 2024.

I. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

J. ASTM A139/A139M - Standard Specification for Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4 and Over); 2016.

K. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2017.

L. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

M. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

N. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2021.

O. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

P. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

Q. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

R. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

S. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

T. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2019.

U. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

V. ITS (DIR) - Directory of Listed Products; current edition.

W. NEMA MG 00001 - Motors and Generators; 2024.

X. NFPA 13 - Standard for the Installation of Sprinkler Systems; 2015, with Errata (2017).

Y. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

Z. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2019.

AA. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate work with other installers to provide conduits necessary for installation of wiring including but not limited to:
      a. Elevator equipment devices remote from elevator machine room or hoistway.
      b. Remote group automatic panel from controller cabinet.
      c. Elevator pit for lighting and sump pump.
      d. Automatic transfer switch from controller cabinet.
      e. Fire alarm panel from controller cabinet.
   2. Coordinate work with other installers for equipment provisions necessary for proper elevator operation, including but not limited to, the following:
      a. Automatic transfer switches with auxiliary contacts for emergency power transfer status indication.
      b. Shunt trip devices for automatic disconnection of elevator power prior to fire suppression system activation.
      c. Overcurrent protection devices selected to achieve required selective coordination.

B. Preinstallation Meeting: Convene manditory meeting at least one week prior to start of this work.
   1. Review schedule of installation submittals including product data and shop drawings which indicate pit dimensions and locations, proper procedures and conditions, and coordination with related work.
   2. Review use of elevator for construction purposes, hours of use, scheduling of use, cleanliness of car, employment of operator, and maintenance of system.

C. Construction Use of Elevator: Provide designated elevator for transport of construction personnel and materials in compliance with ASME A17.1.
   1. Owner to negotiate with manufacturer/installer for construction use of elevator in accordance with terms and conditions of manufacturer's temporary acceptance form.
   2. Make elevator available for construction use as early as possible.
   3. Enclose car with protective plywood on floor, walls, and ceiling.
   4. Provide temporary lighting.
   5. Provide control panel with manual and emergency operation.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit data on following items:
   1. Signal and operating fixtures, operating panels, and indicators.
   2. Car design, dimensions, layout, and components.
   3. Car and hoistway door and frame details.
   4. Electrical characteristics and connection requirements.

C. Shop Drawings: Include appropriate plans, elevations, sections, diagrams, and details on following items:
   1. Pit dimensions and location, including required clearances.
   2. Elevator Equipment and Machines: Size and location of driving machines, power units, controllers, governors, and other components.
   3. Hoistway Components: Size and location of car guide rails, buffers, jack unit and other components.
   4. Rail bracket spacing; maximum loads imposed on guide rails requiring load transfer to building structural framing.
   5. Clearances and over-travel of car.
   6. Locations in hoistway and machine room of traveling cables and connections for car lighting and telephone.
   7. Location and sizes of hoistway and car doors and frames.
   8. Interface with building security system.
   9. Electrical characteristics and connection requirements.
   10. Indicate arrangement of elevator equipment and allow for clear passage of equipment through access openings.
   11. Sump pit dimensions and location.
   12. Pit ladder and components, dimensions and location.

D. Samples: Submit samples illustrating car interior finishes, car and hoistway door and frame finishes, and handrail material and finish in the form of cut sheets or finish color selection brochures.

E. Testing Agency's Qualification Statement.

F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

G. Operation and Maintenance Data:
   1. Parts catalog with complete list of equipment replacement parts; identify each entry with equipment description and identifying code.
   2. Operation and maintenance manual.
   3. Schematic drawings of equipment and hydraulic piping, and wiring diagrams of installed electrical equipment with list of corresponding symbols to identify markings on machine room and hoistway apparatus.

1.06 QUALITY ASSURANCE

A. Maintain one copy of each quality standard document on site.

B. Designer Qualifications: Design guide rails, brackets, anchors, and machine anchors under direct supervision of a licensed Professional Structural Engineer experienced in design of this type of work and licensed in Texas.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years documented experience.

D. Installer Qualifications: Trained personnel and supervisor on staff of elevator equipment manufacturer.

E. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of type specified in this section.

F. Products Requiring Fire Resistance Rating: Listed and classified by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction.

G. Products Requiring Electrical Connection: Listed and classified by UL (DIR) or testing agency acceptable to authorities having jurisdiction as suitable for the purpose indicated in construction documents.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide manufacturer's warranty for elevator operating equipment and devices for one year from Date of Final Acceptance.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design - Hydraulic Elevators: Otis Elevator Company, Hydrofit 3500; www.otis.com.

B. Other Acceptable Manufacturers - Hydraulic Elevators:
   1. Schindler Elevator Corporation: www.schindler.com.

C. Substitutions: See Section 01 6000 - Product Requirements.

D. Products other than Basis of Design are subject to compliance with specified requirements and prior approval of Architect. By using products other than Basis of Design, the Contractor accepts responsibility for costs associated with any necessary modifications to related work, including any design fees.

E. Contractor to coordinate clearances, layout, structural requirements, and infrastructural requirements with selected elevator(s). Dimensions and other information will vary and differ from each elevator product/ model/ manufacturer and may even change when using the basis-of-design product. Do not commence this work, related to foundation work, steel fabrication or other impacted activities until submittals and shop drawings have been produced, coordinated with the other work, and reviewed.

F. Source Limitations: Provide elevator and associated equipment and components produced by a single manufacturer and obtained from a single supplier .

2.02 HYDRAULIC ELEVATORS

A. Hydraulic Passenger Elevator:
   1. Hydraulic Elevator Equipment:
      a. Holeless hydraulic with cylinder mounted within hoistway.
   2. Operation Control Type:
      a. Selective Collective Automatic Operation Control.
   3. Service Control Types:
      a. Standard service control.
      b. Independent service control.
      c. Restricted Access service control.
   4. Interior Car Height: 96 inch. Confirm with elevator manufacturer.

5. Electrical Power: 480 volts; alternating current (AC); three phase; 60 Hz.
6. Freight Car Loading Classification: Class A - General Freight Loading in compliance with ASME A17.1.
7. Rated Net Capacity: 3500 pounds.
8. Rated Speed: 100 to 125 feet per minute.
9. Hoistway Size: As indicated on drawings. Confirm with elevator manufacturer.
10. Interior Car Platform Size: As indicated on drawings. Confirm with elevator manufacturer.
11. Travel Distance: As indicated on drawings.
12. Number of Stops: As indicated on drawings.
13. Hydraulic Equipment Locations:
    a. In Hoistway. No machine room provided.

2.03 COMPONENTS

A. Elevator Equipment:
1. Motors, Hydraulic Equipment, Controllers, Controls, Buttons, Wiring, Devices, and Indicators: Comply with NFPA 70. Refer to Division 26 for additional information.
2. Guide Rails, Cables, Buffers, Attachment Brackets and Anchors: Design criteria for components includes safety factors in accordance with applicable requirements of Elevator Code, ASME A17.1.
3. Buffers:
    a. Spring type for elevators with speed less than or equal to 200 feet per minute.
4. Lubrication Equipment:
    a. Provide grease fittings for periodic lubrication of bearings.
    b. Grease Cups: Automatic feed type.
    c. Lubrication Points: Visible and easily accessible.
5. Power Unit (Oil Pumping and Control Mechanism): A self-contained unit located in the elevator hoistway consisting of the following items:
    a. An oil hydraulic pump.
    b. An electric motor.
    c. Electronic oil control valve with the following components built into single housing; high pressure relief valve, check valve, automatic unloading up start valve, lowering and leveling valve, and electro-magnetic controlling solenoids.
    d. Pump: Positive displacement type pump specifically manufactured for oil-hydraulic elevator service. Pump shall be designed for steady discharge with minimum pulsation to give smooth and quiet operation. Output of pump shall not vary more than 10 percent between no load and full load on the elevator car.
    e. Motor: Standard manufacture motor specifically designed for oil-hydraulic elevator service. Duty rating - motors shall be capable of 80 starts per hour with a 30% motor run time during each start.
    f. Oil Control Unit: The following components shall be built into a single housing. Welded manifolds with separate valves to accomplish each function are not acceptable. Adjustments shall be accessible and be made without removing the assembly from the oil line.
        1) Relief valve shall be adjustable and be capable of bypassing the total oil flow without increasing back pressure more than 10 percent above that required to barely open the valve.
        2) Up start and stop valve shall be adjustable and designed to bypass oil flow during start and stop of motor pump assembly. Valve shall close slowly, gradually diverting oil to or from the jack unit, ensuring smooth up starts and up stops.
        3) Check valve shall be designed to close quietly without permitting any perceptible reverse flow.

4) Lowering valve and leveling valve shall be adjustable for down start speed, lowering speed, leveling speed and stopping speed to ensure smooth "down" starts and stops. The leveling valve shall be designed to level the car to the floor in the direction the car is traveling after slowdown is initiated.
5) Provided with constant speed regulation in both up and down direction. Feature to compensate for load changes, oil temperature, and viscosity changes.

g. Solid State Starting: Provide an electronic starter featuring adjustable starting currents.
h. Oil Type: Readily biodegradable that is USDA certified biobased product, ultra low toxicity, readily biodegradable, energy efficient, high performing fluid made from canola oil with antioxidant, anticorrosive, antifoaming, and metal-passivating additives. Especially formulated for operating in environmentally sensitive areas. USDA certified biobased product, 95% bio-based content, per ASTM D6866.

6. A secondary hydraulic power source (powered by 110VAC single phase) must be provided. This is required to be able to raise (reposition) the elevator in the event of a system component failure (i.e. pump motor, starter, etc.)

B. Electrical Equipment:
1. Motors: NEMA MG 1.
2. Boxes, Conduit, Wiring, and Devices: As required by NFPA 70. Refer to Division 26 for additional information.
3. Sump Pump in Pit: Refer to Division 22 for additional information.
4. Spare Conductors: Provide ten percent in extra conductors and two pairs of shielded audio cables in traveling cables.

2.04 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with ASME A17.1, applicable local codes, and authorities having jurisdiction (AHJ).

B. Accessibility Requirements: Comply with ADA Standards.

C. Perform structural steel design, fabrication, and installation in accordance with AISC 360.

D. Comply with seismic design requirements in accordance with ASME A17.1, applicable local codes, and authorities having jurisdiction (AHJ).
1. Complying with Elevator Safety Requirements for Seismic Risk Zone in accordance with ASME A17.1, ASCE 7 and other related requirements.
a. Project Seismic Risk: As indicated on drawings.
2. Provide earthquake emergency operations in accordance with ASME A17.1 requirements.

E. Perform welding of steel in accordance with AWS D1.1/D1.1M.

F. Fabricate and install door and frame assemblies in accordance with NFPA 80 and in compliance with requirements of authorities having jurisdiction.

G. Perform electrical work in accordance with NFPA 70.

H. Comply with fire protection sprinkler system of hoistway design in accordance with NFPA 13 requirements and authorities having jurisdiction (AHJ). Refer to Division 21 - Fire Suppression.

2.05 OPERATION CONTROLS

A. Elevator Controls: Provide vandal resistant landing operating panels and landing indicator panels.
1. Landing Operating Panels: Metallic type, one for originating "Up" and one for originating "Down" calls, one button only at terminating landings; with illuminating indicators.
2. Landing Indicator Panels: Illuminating.
3. Comply with ADA Standards for elevator controls.

B. Car Lantern and Chime: A directional lantern visible from the corridor shall be provided in the car entrance. When the car stops and the doors are opening, the lantern shall indicate the direction in which the car is to travel and a chime will sound.

C. Hoistway Access key-switch at top floor in entrance jamb.

D. Hoistway Access key-switch at lowest floor in entrance jamb.

E. Interconnect elevator control system with building security, fire alarm, card access, and smoke alarm systems.

F. Door Operation Controls:
   1. Program door control to open doors automatically when car arrives at floor landing.
   2. Render "Door Close" button inoperative when car is standing at dispatch landing with doors open.
   3. Door Operation: Provide a direct current motor driven heavy duty operator designed to operate the car and hoistway doors simultaneously. Door movements shall be electrically cushioned at both limits of travel and the door operating mechanism shall be arranged for manual operation in event of power failure. Doors shall automatically open when the car arrives at the landing and automatically close after an adjustable time interval or when the car is dispatched to another landing. Closed-loop, microprocessor controlled motor-driven linear door operator, with adjustable torque limits, also acceptable. AC controlled units with oil checks or other deviations are not acceptable.
      a. No Un-Necessary Door Operation: The car door shall open only if the car is stopping for a car or hall call, answering a car or hall call at the present position or selected as a dispatch car.
      b. Door Open Time Saver: If a car is stopping in response to a car call assignment only (no coincident hall call), the current door hold open time is changed to a shorter field programmable time when the electronic door protection device is activated.
      c. Double Door Operation: When a car stops at a landing with concurrent up and down hall calls, no car calls, and no other hall call assignments, the car door opens to answer the hall call in the direction of the car's current travel. If an onward car call is not Nudging Operation: The doors shall remain open as long as the electronic detector senses the presence of a passenger or object in the door opening. If door closing is prevented for a field programmable time, a buzzer will sound. When the obstruction is removed, the door will begin to close at reduced speed. If the infra-red door protection system detects a person or object while closing on nudging, the doors will stop and resume closing only after the obstruction has been removed.
      d. Limited Door Reversal: If the doors are closing and the infra-red beam(s) is interrupted, the doors will reverse and reopen partially. After the obstruction is cleared, the doors will begin to close.
      e. Door Open Watchdog: If the doors are opening, but do not fully open after a field adjustable time, the doors will recycle closed then attempt to open six times to try and correct the fault.
      f. Door Close Watchdog: If the doors are closing, but do not fully close after a field adjustable time, the doors will recycle open then attempt to close six times to try and correct the fault.
      g. Door Close Assist: When the doors have failed to fully close and are in the recycle mode, the door drive motor shall have increased torque applied to possibly overcome mechanical resistance or differential air pressure and allow the door to close.
   4. Door Safety:

a. Primary door protection shall consist of a two-dimensional, multi-beam array projecting across the car door opening. Under normal operation and for any door position, the system shall detect as a blockage an opaque object that is equal to or greater than 1.3 inches in diameter when inserted between the car doors at vertical positions from within 1 inch above the sill to 71 inches above the sill. Under degraded conditions (one or more blocked or failed beams), the primary protection shall detect opaque objects that are equal to or greater than 4” in diameter for the same vertical coverage. If the system performance is degraded to the point that the 4” object cannot be detected, the system shall maintain the doors open or permit closing only under nudging force conditions.
b. The secondary protection shall have an anti-nuisance feature which will ignore detection in the secondary zone after continual detection occurs for a significant time period in the secondary zone without corresponding detection in the primary protection zone; i.e. a person/object is in the entryway but does not enter. Normal secondary protection shall be re-enabled whenever a detection occurs in the primary zone.
c. The reaction time of the door detector sub-system shall not exceed 60 milliseconds when both primary and secondary protection capabilities are active; nor 40 milliseconds when the secondary protection is disabled.
d. Door nudging operation to occur if doors are prevented from closing for an adjustable period of time.

G. Provide microprocessor-based control system with utilizes on-board diagnostics for servicing, trouble-shooting, and adjusting without requiring the use of an outside service tool. If an on-board diagnostic system is not provided, a handheld service tool (or laptop), owner's license, operation manual, and tool instructions must be provided in addition to the control system. System shall be a non-proprietary control system/open protocol. Provide remote elevator monitoring capabilities
1. Locate controller in hoistway or machine room as indicated.

H. Hall Stations
1. Floor Identification Pads: Provide door jamb pads at each floor. Jamb pads shall comply with applicable accessibility standards.
2. All fixtures shall be designed to be VANDAL RESISTANT.
3. Provide keyed operating switch for access at hall stations.

I. Signal Devices and Fixtures
1. Car-Operating Panel: A panel shall be provided which contains all push buttons, key switches, and message indicators for elevator operation. Raised markings Braille markings shall be provided for each push-button.
2. Car Fixture Finish:
a. Satin stainless steel
b. Applied car operating panel shall be furnished. It shall contain a bank of round metal mechanical illuminated buttons. Flush mounted to the panel and marked to correspond to the landings served, an emergency call button, door open and door close buttons, and switches for lights, inspection and the exhaust fan. The emergency call button shall be connected to a bell that serves as an emergency signal. All buttons to have raised numerals and Braille markings. Red LED halo illumination with Flat Flush Target finishes: satin stainless steel.
3. Car Position Indicator.
4. A compliant communication device shall be provided which has been designed in response to applicable accessibility requirements integral with the car operating panel.
a. ADA Phone – Code Compliant Cellular Connectivity: See paragraph 2.11.

5. Car Lantern and Chime: A directional lantern visible from the corridor shall be provided in the car entrance. When the car stops and the doors are opening, the lantern shall indicate the direction in which the car is to travel and a chime will sound.
6. Hall Fixtures: Hall fixtures shall be provided with necessary push buttons and key switches for elevator operation. Raised markings shall be provided for each push-button.
7. Fixture Finish: satin stainless steel.
8. Landing Passing Signal: A chime bell shall sound in the car to tell a passenger that the car is either stopping at or passing a floor served by the elevator.

J. Provide "Firefighter's Emergency Operation" in accordance with ASME A17.1, applicable building codes, and authorities having jurisdiction (AHJ).
1. Designated Landing: Main Lobby.

2.06 OPERATION CONTROL TYPE

A. Selective Collective Automatic Operation Control: Applies to car in single elevator shaft.
1. Refer to description provided in ASME A17.1.
2. Automatic operation by means of one button in the car for each landing served and by "UP" and "DOWN" buttons at the landings.
3. Stops are registered by momentary actuation of landing car buttons without consideration of the number of buttons actuated or the sequence buttons are actuated, but the stops are made in the order that landings are reached in each direction of travel.
4. All "UP" landing calls are made when car is traveling in the up direction.
5. All "DOWN" landing calls are made when car is traveling in the down direction.
6. Uppermost and lowermost calls are answered as soon as they are reached without consideration of the car travel direction.

2.07 SERVICE CONTROL TYPE

A. Independent Service Control:
1. Provide key operated "Independent Service" on car operating panel. Activation will remove that car from normal operation and cancel pre-registered car calls.
2. Car will respond to selected floor. Car will not respond to any calls from landing call buttons. Car will only respond to calls placed on the car operating panel. Doors will remain open at last landing requested. Doors will close with a constant pressure on "Door Close" button.
3. Key activation to normal operation will return car to normal operation.

B. Restricted Access Service Control:
1. Landing Call Lock-out: Provide card reader provisions or a key operated switch with spring return with key removable only in "Lock-Out" position in landing control station that performs the following when activated:
a. Restricts or permits landing call registration for that landing.
b. Causes the elevator to not respond to that landing.
2. Allow "Firefighter's Emergency Operation" to take control priority over "Restricted Access Service Control".

2.08 EMERGENCY POWER

A. Set-up elevator operation to run with elevator emergency power supply when the normal building power supply fails, and in compliance with ASME A17.1 requirements.

B. Elevator Emergency Power Supply: Supplied by battery backup; provide elevator system components as required for emergency power characteristics.

C. Emergency Lighting: As selected from manufacturers standard line.

D. Provide operational control circuitry for adapting the change from normal to emergency power.

E. Upon transfer to emergency power, advance one elevator at a time to a pre-selected landing, stop car, open doors, disable operating circuits, and hold in standby condition.

2.09 MATERIALS

A. Steel Cylinder Casing: ASTM A139/A139M, Grade A steel.

B. Rolled Steel Sections, Shapes, Rods: ASTM A36/A36M.

C. Steel Sheet: ASTM A1008/A1008M, Designation CS (commercial steel), with matte finish.

D. Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.

E. Stainless Steel Sheet: ASTM A666/A666M, Type 441; No. 4 Brushed finish unless otherwise indicated.

F. Stainless Steel Bars, Shapes and Moldings: ASTM A276/A276M, Type 441.

G. Extruded Aluminum: ASTM B221 (ASTM B221M), natural anodized finish unless otherwise indicated.

H. Aluminum Sheet: ASTM B209 (ASTM B209M), 3105 alloy, O temper.

I. Tempered Glass: 1/4 inch minimum thickness, fully tempered in compliance with ASME A17.1, 16 CFR 1201, ANSI Z97.1, and ASTM C1048 tempered glass requirements.

J. Laminated Glass: 3/8 inch minimum thickness, and in compliance with ASME A17.1, 16 CFR 1201, ANSI Z97.1, and ASTM C1172 laminated glass requirements.

2.10 CAR AND HOISTWAY ENTRANCES

A. Elevator, as indicated on drawings:
   1. Car and Hoistway Entrances, Each Elevator Floor Lobby:
      a. Hoistway Fire Rating: As indicated on drawings.
      b. Elevator Door Fire Rating: As indicated on drawings.
      c. Framed Opening Finish and Material: Brushed stainless steel.
      d. Car Door Material: Stainless steel, with rigid sandwich panel construction.
      e. Hoistway Door Material: Stainless steel, with rigid sandwich panel construction.
      f. Door Operation: As indicated on the drawings.
      g. Door Width: As indicated on drawings.
      h. Door Height: As indicated on drawings.
      i. Sills: Extruded aluminum.

B. Sills/Thresholds: Configure to align with frame return and coordinate with floor finish.

C. Gasketing: Provide acoustic type gasketing at hoistway doors and frames to minimize audible noise due to car activities in the hoistway, and air pressure differential between hoistway and landing floors.

2.11 CAR EQUIPMENT AND MATERIALS

A. Elevator Car:
   1. Car Operating Panel: Provide main; flush-mounted applied face plate, with vandal resistant illuminated call buttons corresponding to floors served with hoistway access, "Door Open/Door Close" buttons, "Door Open" button, "Door Close" button, alarm button, and top of car inspection.
      a. Panel Material: Integral with front return; one per car.
      b. Car Floor Position Indicator: Above door with illuminating position indicators.
      c. Locate alarm button where it is unlikely to be accidentally actuated; not more than 54 inch above car finished floor.

d. Emergency Communications System: Integral phone system provided. ADA Phone – Code Compliant Cellular Connectivity: Contractor shall provide a phone service through a self-contained cellular based VoIP system. This system shall meet code, include a backup battery capable of powering the emergency communication equipment for 4+ hours in the event of a power outage. The solution shall have remote monitoring capability to ensure continuous connectivity with a means of remote troubleshooting. Remote monitoring capability shall include, at a minimum, the ability to monitor connectivity and power supply. Remote monitoring shall be capable of providing local alerts to response personnel when on-site intervention is required.

2. Ventilation: Two speed fan with ventilation per manufacturer standard operation.
3. Subfloor: Underlayment grade, exterior plywood, 5/8" nominal thickness.
4. Flooring: See Schedule of Materials and Colors for required flooring. Adjust recess for flooring material as well as load capacity of car. The flooring contractor must be an approved TDLR Vendor or you must subcontract the flooring through the elevator company. This is required for final elevator inspection with TDLR.
5. Wall Base: Recessed stainless steel, 4 inch high.
6. Front Return Panel: Stainless steel.
7. Side Walls: Stainless steel.
8. Rear Wall: Stainless steel.
9. Hand Rail: Stainless steel, at rear wall. Provide open clearance space 1-1/2 inch (38 mm) wide to face of wall.
   a. Round, Metal Tube: 1-1/2 inch diameter.
   b. Stainless Steel Finish: No. 4 Brushed.
10. Ceiling: Downlight type, metal pans with suspended LED downlights.
    a. Canopy Ceiling: Stainless steel.
11. Provide emergency access panel for egress from car at ceiling.
12. On/Off Light Switch located in car operating panel.

B. Car Accessories:
   1. Certificate Frame: Stainless steel frame glazed with tempered glass, and attached with tamper-proof screws.
   2. Protective Pads: Canvas cover, padded with impact-resistant fill material, sewn with piping edges; fire resistant in compliance with ASME A17.1, covering side and rear walls and front return; provide one set for each elevator.
      a. Color: As selected by Architect.
      b. Provide at least 4 inch clearance from bottom of pad to finished floor.
      c. Pad Supports: Stainless steel studs, and mounted from ceiling frame.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting this work.

B. Verify that hoistway, pit, and machine room are ready for work of this section.

C. Verify hoistway shaft and openings are of correct size and within tolerance.

D. Verify location and size of machine foundation and position of machine foundation bolts.

E. Verify that electrical power is available and of correct characteristics.

F. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 PREPARATION

A. Arrange for temporary electrical power for installation work and testing of elevator components, and comply with requirements of Section 01 5000 - Temporary Facilities and Controls.

B. Maintain elevator pit excavation free of water.

3.03 INSTALLATION

A. Proceeding with work associated with the elevator pit, elevator hoistway, and or elevator equipment without appropriately reviewed submittals is at Contractor's own risk.

B. Proceeding with work associated with the elevator pit, elevator hoistway, and or elevator equipment without pre-installation meeting is at Contractor's own risk.

C. Proceeding with work associated with the elevator pit, elevator hoistway, and or elevator equipment without properly notifying Owner and Architect or their representatives with 72 hour minimum notice that work will commence on X date is at Contractor's own risk.

D. Coordinate this work with installation of hoistway wall construction.

E. Install system components, and connect equipment to building utilities.

F. Provide conduit, electrical boxes, wiring, and accessories. Refer to Division 26 for additional information.

G. Install hydraulic piping between cylinder and pump unit.

H. Mount machines, motors, and pumps on vibration and acoustic isolators.
   1. Place on structural supports and bearing plates.
   2. Securely fasten to building supports.
   3. Prevent lateral displacement.

I. Install hoistway, elevator equipment, and components in accordance with approved shop drawings.

J. Install guide rails to allow for thermal expansion and contraction movement of guide rails.

K. Accurately machine and align guide rails, forming smooth joints with machined splice plates.

L. Bolt brackets to self drilling expansion shell anchors.

M. Field Welds: Chip and clean away oxidation and residue with wire brush; spot prime surface with two coats.

N. Install hoistway door sills, frames, and headers in hoistway walls; grout sills in place, set hoistway floor entrances in alignment with car openings, and align plumb with hoistway.

O. Fill hoistway door frames solid with grout in accordance with Section 04 2000.

P. Structural Metal Surfaces: Clean surfaces of rust, oil or grease; wipe clean with solvent; prime two coats.

Q. Machine Room Components: Clean and degrease; prime one coat, finish with one coat of enamel.

R. Wood Surfaces not Exposed to Public View: Finish with one coat primer; one coat enamel.

S. Adjust equipment for smooth and quiet operation.

3.04 TOLERANCES

A. Guide Rail Alignment: Plumb and parallel to each other in accordance with ASME A17.1 and ASME A17.2.

B. Car Movement on Aligned Guide Rails: Smooth movement, without any objectionable lateral or oscillating movement or vibration.

3.05 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Testing and inspection by regulatory agencies will be performed at their discretion.
   1. Schedule tests with agencies and notify Owner and Architect.
   2. Obtain permits as required to perform tests.

3. Document regulatory agency tests and inspections in accordance with requirements.
4. Perform tests required by regulatory agencies.
5. Furnish test and approval certificates issued by authorities having jurisdiction.

C. Perform testing and inspection in accordance with requirements.
1. Inspectors shall be certified in accordance with ASME QEI-1.
2. Perform tests as required by ASME A17.2.
3. Provide at least two weeks written notice of date and time of tests and inspections.
4. Supply instruments and execute specific tests.

D. Perform tests in the presence of Owner and Architect.

E. Operational Tests:
1. Perform operational tests in the presence of Owner and Architect.
2. At an agreed time, and the building occupied with normal building traffic, conduct tests to verify performance.
a. Furnish event recording of each landing call registrations, time initiated, and response time throughout entire working day.

3.06 ADJUSTING

A. Adjust for smooth acceleration and deceleration of car to minimize passenger discomfort.

B. Adjust with automatic floor leveling feature at each floor landing to reach 1/4 inch maximum from flush with sill.

3.07 CLEANING

A. Remove protective coverings from finished surfaces.

B. Clean surfaces and components in accordance with manufacturers written instructions.

3.08 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. See Section 01 7900 - Demonstration and Training, for additional requirements.

C. Demonstrate proper operation of equipment to Owner's designated representative.

D. Demonstration: Demonstrate operation of system to Owner's personnel.
1. Use operation and maintenance data as reference during demonstration.
2. Conduct walking tour of project.
3. Briefly describe function, operation, cleaning and maintenance of each component.

E. Training: Train Owner's personnel on cleaning and operation and maintenance of system.
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 training personnel.
4. Location: At project site, unless noted otherwise.

3.09 PROTECTION

A. Do not permit construction traffic within car after cleaning.

B. Protect installed products until Date of Substantial Completion.

C. Touch-up, repair, or replace damaged products and materials prior to Date of Substantial Completion.

3.10 MAINTENANCE

A. Refer to Section 01 7000 - Execution and Closeout Requirements, for additional requirements relating to initial maintenance service.

B. Provide Initial Maintenance Contract of elevator system and components in accordance with ASME A17.1 and requirements as indicated for 12 months from Date of Substantial Completion.

C. Perform maintenance contract services using competent and qualified personnel under the supervision and direct employ of the elevator manufacturer or original installer.

D. Maintenance contract services shall not be assigned or transferred to any agent or other entity without prior written consent of Owner.

E. Examine system components periodically.

F. Include systematic examination, adjustment, and lubrication of elevator equipment.

G. Maintain and repair or replace parts, whenever required, using parts produced by original equipment manufacturer.

H. Perform work without removing cars from use during peak traffic periods.

I. Provide emergency call back service during regular working hours throughout period of this maintenance contract.

J. Maintain an adequate stock of parts for replacement or emergency purposes, and have personnel available to ensure the fulfillment of this maintenance contract without unreasonable loss of time.

END OF SECTION

SECTION 14 4100
PEOPLE LIFTS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Ceiling-mounted patient transfer system.

1.02 RELATED SECTIONS:

A. Section 05 5000 – Metal Fabrications.

B. Section 06 1000 – Rough Carpentry.

C. Section 09 5100 – Acoustical Ceilings.

1.03 REFERENCES

A. Americans with Disabilities Act (ADA).

B. Texas Accessibility Standards (TAS).

1.04 DEFINITIONS

A. Ceiling Mounted Patient Transfer System includes remote hand control, battery charging system, patient slings, warranty and devices as indicated and required for the safe operation of the ceiling mounted patient transfer system.

1.05 SUBMITTALS

A. Shop Drawings: Submit in accordance with Section 01 3000 – Administrative Procedures, Shop Drawings, Product Data and Samples. Include manufacturer's installation instructions and track layout.

B. Closeout Submittals:
   1. Submit under provisions of Section 01 7800 - Closeout Submittals.
   2. Submit Material Safety Data Sheets under provisions of Section 01 7800 - Closeout Submittals for the following items:
      a. All mastics, glues, and adhesives

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Amico Mobility Solutions Corporation: www.amico.com.

B. Guldmann, Inc.: www.guldmann.net

C. Horcher Lifts: www.horcherlifts.com.

D. Substitutions: See Section 01 6000 - Product Requirements.

2.02 OVERHEAD LIFTING SYSTEM

A. System Description: Provide ceiling-mounted battery operated personnel transfer system complete with sling, straight and curved track system.
   1. Basis of Design: Horcher, Model #PC2

B. System Requirements:
   1. Load rating for portable lifts: 440 pound capacity
   2. Travel (up/down): 6-8 feet per minute
   3. Charger: 110v/2 4v-1 Amp.
   4. Motor: 1 per room where patient transfer is required.
   5. Battery: 24 volt DC.
   6. Emergency Lowering: Electrical and Mechanical.
   7. Provide all accessories and equipment required for transfer between rooms.

C. Provide Warranty for ceiling mounted patient transfer system that matches or exceeds:

1. 2 years on all overhead lift system parts
2. 1 years on all labor
3. 1 year on all patient slings

PART 3 – EXECUTION

3.01 INSTALLATION

A. Installed transfer system securely anchored to provide rigid installation. Lift shall be installed in strict accordance with manufacturer's instructions.

B. Coordinate adequate supports in ceiling per manufacturers requirements for pendant support system.

C. Maximum suspension from support steel to finished ceiling shall be no greater than 60". Any distance greater than 60" shall require additional support steel provided by others.

3.02 FIELD QUALITY CONTROL

A. Certificate: The distributor or manufacturer's representative shall certify, in writing, to the Owner that the installation, adjustment and performance are in accordance with the manufacturer's recommendations.

3.03 ADJUST AND CLEAN

A. Adjusting: Carefully adjust and regulate the transfer system after installation.

END OF SECTION

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PROJECT MANUAL – VOLUME 2 OF 2

Intermediate School Replacement

Tomball Independent School District

Tomball, Texas

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MORE THAN ARCHITECTS

PROJECT MANUAL

Project Name:	Intermediate School Replacement – Volume 2 of 2		
Client Name:	Tomball Independent School District	Location:	Tomball, Texas
Project Number:	0802-04-01	Date:	July 15, 2026

All inquiries shall be forwarded to Chris Brennan, Huckabee; chris.brennan@huckabee-inc.com; 800.687.1229.

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END OF SECTION

SECTION 21 1313
FIRE SPRINKLER PIPING SYSTEM

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Fire protection system drawings, refer to sheets beginning with "[FP]."

1.02 SUMMARY

A. The Work covered by this Specification Section includes providing and furnishing all design, engineering, labor, materials, transportation, tools, piping, fittings, valves, hangers and supports, devices, sprinklers, and any other components and services required for the installation of a complete, operational, fully functional, and code compliant automatic sprinkler systems.

B. The Work must comply with all requirements of these specifications, including where the specified requirements are exceeding minimum code requirements. Any design inconsistencies or conflicts within this document must be resolved through the Request for Information (RFI) process prior to the contractor's bid submission. All fire alarm system related RFIs will be reviewed and processed by the Owner's Representative and Design Team.

C. The Contractor shall perform all Work in accordance with the Specifications, and subject to the terms and conditions of the Contract. Work shall include, but not be limited to, the following as applicable:
   1. Wet pipe automatic sprinkler systems.
   2. Dry pipe automatic sprinkler systems.

D. No Work shall be performed until the Shop Drawings, calculations, and product data have been approved by the Owner's Representative, Design Team, and Authority Having Jurisdiction (AHJ). The Contractor is solely liable for any material purchases made prior to the approval of the drawings.

1.03 DEFINITIONS

A. Design Team: engineers of record, architect, and other professionals involved in the development of the contract documents.

B. Standard-Pressure Sprinkler Piping: Wet pipe sprinkler system piping designed to operate at working pressure of 175 psi maximum.

1.04 SYSTEM DESCRIPTIONS

A. Wet-Pipe Automatic Sprinkler System: Automatic sprinklers are attached to water-filled piping that is connected to a reliable water supply. Water discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts fusible link or destroys frangible device.

B. Dry-Pipe Automatic Sprinkler System: Automatic sprinklers are attached to piping filled with compressed air or nitrogen gas. Opening of sprinklers releases compressed air or nitrogen gas and permits water pressure to open dry-pipe valve. Water then flows into piping and discharges from opened sprinklers.

C. Combined Standpipe and Sprinkler System: Water-based fire protection system with both standpipe and sprinkler systems. Sprinkler system is supplied from standpipe system.

1.05 PERFORMANCE REQUIREMENTS

A. Delegated Design: Contractor is responsible for a complete design complying with the applicable codes and standards, this Specification Section, and all Related Documents.

B. Automatic sprinkler system design shall be approved by the authorities having jurisdiction.
   1. Margin of Safety for Available Water Flow and Pressure: 10 percent or greater where required by the local authority having jurisdiction (AHJ), including losses through water-service piping, valves, hose connections, and backflow preventers.
   2. Sprinkler Occupancy Hazard Classifications shall be in accordance with applicable edition of NFPA 13.
   3. Minimum Density for Automatic-Sprinkler Piping Design:
      a. Light Hazard: 0.10 gpm/ft^2 over 1,500 ft^2.
      b. Ordinary Hazard Group 1: 0.15 gpm/ft^2 over 1,500 ft^2.
      c. Ordinary Hazard Group 2: 0.20 gpm/ft^2 over 1,500 ft^2.
      d. Wet pipe automatic sprinkler system design may be decreased for the use of quick response sprinklers in accordance with NFPA 13.
      e. Minimum Design Area shall increase 30 percent for dry-pipe and pre-action sprinkler systems in accordance with NFPA 13.
   4. Maximum Protection Area per Sprinkler: Per NFPA 13.
   5. Total Combined Hose-Stream Demand Requirement: Per NFPA 13.
   6. System area shall not exceed 52,000 square feet or the area of the smoke compartment protected [or 40,000 square feet for high-hazard areas], whichever is less.
   7. A single sprinkler system shall not serve more than one (1) smoke compartment.
   8. Standard Piping System Component Working Pressure: Listed for at least 175 psi.

1.06 ACTION SUBMITTALS

A. General Submittal Requirements:
   1. Submittals shall be reviewed by the Design Team prior to submitting them to authorities having jurisdiction.
      a. Should any submittal not be approved by the owner, owner's representative, or local authority and require re-submittal, all changes to the drawings, resulting from comment corrections or drawing changes, shall be individually clouded, provided with a reference number reflecting the date of resubmission, and provided with a general description of the changes.
      b. Should re-submission (submittal after initial submittal) not be approved and require a subsequent submittal (third and beyond), the owner reserves the right to back charge the contractor for any review costs and/or permit fees for subsequent submittals incurred by the owner and/or the owner's representatives, including but not limited to the architect and the fire protection consultant.
   2. Comply with:
      a. NFPA 13 "Plans and Calculations" chapter.
      b. NFPA 20 Section 4.2 "Approval Required".
      c. NFPA 14 "Plans and Calculations" chapter.

B. Simultaneous Action Submittals: Delegated-Design Product Data Submittal, Delegated-Design Calculation Submittal, Delegated-Design Shop Drawings, and Manufacturer's Fire Pump Curve submittal (if applicable) shall be submitted simultaneously. Incomplete submittals will be returned as "Rejected".

C. Specification Compliance Confirmation: Provide a copy of this specification annotated to confirm review and compliance with all applicable sections. Indicate compliance with a green checkmark adjacent to the respective section. Where a section is not applicable, mark the section as "NA" in red text and provide a concise explanation why the section is not applicable. Substitution requests shall be marked with an "S" in blue text and a reference to the formal Request for Information (RFI).

D. Delegated-Design Product Data Submittal: Provide product data sheets for all piping, material, equipment, and devices being proposed. If the product data sheet lists more than a single

product, provide a clear indication of which product/model number is being proposed. Product submittals shall be electronically submitted in .pdf format with linked bookmarks corresponding with a table of contents organized by component type. Include the following:

1. Piping materials, including dielectric fittings, flexible connections, and specialty fittings.
2. Pipe hangers and supports, including seismic restraints where applicable.
3. Valves, including listed fire-protection valves, unlisted general-duty valves, and specialty valves and trim.
4. Air compressors, including electrical data.
5. Sprinklers, escutcheons, cover plates, and guards. Include sprinkler flow characteristics, mounting, finish, and other pertinent data.
6. Hose connections, including size, type, and finish.
7. Fire department connections, including type; number, size, and arrangement of inlets; caps and chains; size and direction of outlet; escutcheon and marking; and finish.
8. Alarm devices, including electrical data.
9. Hydraulic information for fittings, valves, and sprinklers.

E. Delegated-Design Calculation Submittal: Signed and sealed/stamped by the qualified professional responsible for their preparation. Hydraulic calculation submittals shall be electronically submitted in .pdf format with linked bookmarks corresponding with a table of contents organized by design area. Include the following:

1. Hydraulic calculations in accordance with NFPA 13 and 14.

F. Delegated-Design Shop Drawings: Signed and sealed/stamped by the qualified professional responsible for their preparation. Include the following:

1. All applicable information listed in Chapter 23 of NFPA 13 and Chapter 4 of NFPA 20.
2. Riser detail showing valves, fittings, pipe diameters and lengths, devices, and hydraulic nodes.
3. Sufficient building information to convey the hazards, obstructions, uses, walls, ceilings, structure, ceiling/deck heights, and pertinent information necessary to confirm the design is compliant.
4. Sprinkler legend on each sheet with the total sprinkler count, coverage type (e.g., standard, extended, etc.), SIN, response-type, temperature rating, finish, color, k-factor, minimum operating pressure or flow (where manufacturer specified), dry-type (where applicable), maximum spacing calculated and used for extended coverage sprinklers (where permitted), and orientation.
5. Where flexible sprinkler drops are used, indicate on the drawings the manufacturer, maximum length, maximum number of bends, and equivalent length used at each location (where it varies). Must match the product data and the hydraulic calculations.

1.07 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Designer and Installer:

1. Copy of State license showing the fire sprinkler contractor to be certified in the layout and installation of fire sprinkler systems.
2. Copy of NICET certification showing the fire sprinkler contractor to be certified in the layout, equipment selection, installation, acceptance testing, troubleshooting, servicing and sales of automatic sprinkler systems.

1.08 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire protection systems and components to include in operation and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Provide a minimum of three (3) hardcopies of NFPA 25, edition referenced by the applicable edition of NFPA 13. The copies provided shall be purchased from NFPA and shall not violate copyright laws.
2. Manufacturer's required maintenance related to system warranty requirements.

B. Final Testing and Completion Documents: Indicate, document, and interpret test results for compliance with performance requirements in accordance with NFPA standards.

C. Welding certificates.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For sprinkler specialties to include in emergency, operation, and maintenance manuals.

F. Sprinklers shall be referred to on drawings, submittals, and other documentation, by the sprinkler identification number as specifically published in the appropriate agency listing or approval. Trade names or other abbreviated designations shall not be allowed.

1.09 QUALITY ASSURANCE

A. The installation shall be performed by a company specializing in designing and installing the products specified in this Section with a minimum of five (5) years of experience, and certified/licensed by the appropriate State agency for such work.

B. Common Requirements for Code Compliance: In cases where differences occur between building codes, state laws, local ordinances, industry standards, and the Contract Documents, the most stringent shall apply. Perform the following:
1. Promptly notify the Owner or Owner's Representative in writing of any such difference.
2. Obtain approval from the Owner or Owner's Representative 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.

C. 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 Owner or Owner's Representative in writing of any such difference.
2. Obtain approval from Owner or Owner's Representative before proceeding with the Work.

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. Designer Qualifications: Shop Drawings and Calculations shall be prepared and signed by personnel with the following qualifications:
1. Trained and certified by manufacturer.
2. Certified by NICET as Level III (or higher) in Water-based Fire Protection Systems or a qualified professional engineer.
3. Current Qualifying License issued by the State.

F. Installer Qualifications: Personnel shall be trained and be certified by NICET in Water-based Fire Protection Systems as follows:
1. Foreman: Level III or higher.
2. Pipe Fitter: Level I or higher.

G. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

H. NFPA Standards: Fire-suppression-system equipment, specialties, accessories, installation, and testing shall comply with the following:
   1. NFPA 13, Standard for the Installation of Sprinkler Systems, applicable edition.
   2. NFPA 14, Standard for the Installation of Standpipe and Hose Systems, applicable edition.
   3. NFPA 20, Standard for the Installation of Stationary Fire Pumps for Fire Protection, applicable edition.

I. To assure uniformity and compatibility of piping components in grooved piping systems, all grooved products utilized shall be supplied by a single manufacturer. Grooving tools for 1-inch grooved piping shall be supplied from the same manufacturer as the grooved components.

1.10 COORDINATION

A. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

B. Coordinate the installation of supervised and activated devices with the fire alarm contractor.

C. Coordinate the installation of piping in shared support systems with other trades using the shared support system.

D. Space allocations for materials, equipment, and devices have been made based on present and known future requirements and the dimensions of items of equipment or devices of a specific manufacturer. Verify that all materials, equipment, and devices proposed for use on this Project are within the constraints of the allocated space.

E. Coordinate arrangement, mounting, and support of materials, devices, and equipment:
   1. To allow maximum possible headroom.
   2. To provide for ease of accessing equipment and devices with minimum interference to other installations.

F. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components, as they are constructed.

G. Coordinate location of access panels and doors for valves that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08.

H. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07.

1.11 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Sprinkler Cabinets: Finished, wall-mounting, steel cabinet with hinged cover, with space for required spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench.

PART 2 PRODUCTS

2.01 STEEL PIPE AND FITTINGS

A. Threaded-End, Schedule 40 Steel Pipe: ASTM A 53/A 53M, ASTM A 135, or ASTM A 795, with factory- or field-formed threaded ends.
   1. Cast-Iron Threaded Flanges: ASME B16.1.
   2. Ductile- and Malleable-Iron Threaded Fittings: ASME B16.3.
   3. Gray-Iron Threaded Fittings: ASME B16.4.
   4. Steel Threaded Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106, Schedule 40, seamless steel pipe. Include ends matching joining method.

5. Steel Threaded Couplings: ASTM A 865.

B. Plain-End, Schedule 40 Steel Pipe: ASTM A 53/A 53M, ASTM A 135, or ASTM A 795.
   1. Steel Welding Fittings: ASTM A 234/A 234M, and ASME B16.9 or ASME B16.11.
   2. Steel Flanges and Flanged Fittings: ASME B16.5.

C. Grooved-End, Schedule 10 or Schedule 40 Steel Pipe: ASTM A 53/A 53M, ASTM A 135, or ASTM A 795, with factory- or field-formed, roll-grooved ends in NPS 1¼ and larger.
   1. Grooved-End, Schedule 10 Steel Pipe: ASTM A 135 or ASTM A 795, Schedule 10 in NPS 2½ and larger; and NFPA 13-specified wall thickness in NPS 6 to NPS 10; with factory- or field-formed, roll-grooved ends.
   2. Grooved-End, Schedule 40 Steel Pipe: ASTM A 135 or ASTM A 795, Schedule 40 in NPS 1¼ to 2; with factory- or field-formed, roll-grooved ends.
   3. Grooved-End, Schedule 40 Steel Pipe: ASTM A 135 or ASTM A 795, Schedule 40 in NPS 1 ; with factory- or field-formed, grooved ends using a Victaulic 1-inch groover and Victaulic 1” grooved fittings.
   4. Grooved-Joint Piping Systems:
      a. Manufacturers:
         1) Anvil International, Inc.
         2) Victaulic Co. of America.
      b. Grooved-End Fittings: UL-listed, ASTM A 536, ductile-iron casting with OD matching steel-pipe OD or ASTM A53 forged or fabricated from carbon steel pipe with factory grooved ends designed to accept grooved mechanical couplings from the same manufacturer.
      c. Grooved-End-Pipe Couplings: UL 213 and AWWA C606, rigid pattern, unless otherwise indicated; gasketed fitting matching steel-pipe OD. Include ductile-iron housing with keys matching steel-pipe and fitting grooves, synthetic rubber gasket listed for use with housing, and steel bolts and nuts.
         1) Rigid Type: Housings shall be cast with offsetting, angle-pattern bolt pads to provide system rigidity and support and hanging in accordance with NFPA 13. Tongue and recess rigid type couplings shall only be used if the contractor uses a torque wrench for installation. Required torque shall be in accordance with the manufacturer’s latest recommendations.
            (a) Victaulic 1” couplings.
            (b) 1¼” through 4”: “Installation Ready” stab-on design, for direct ‘stab’ installation onto grooved end pipe without prior field disassembly and no loose parts.
            (c) 5” and larger: Standard rigid coupling.
      d. Grooved-End-Pipe Flange Adapters: UL213 and AWWA C606, steel pipe OD dimensions, ASTM A536 ductile iron housing, flat faced, designed for incorporating flanged components with ANSI Class 125 bolt-hole patterns to a grooved piping system.

D. Plain-End, Schedule 10 Steel Pipe: ASTM A 135 or ASTM A 795, Schedule 10 in NPS 4 and smaller; and NFPA 13 specified wall thickness in NPS 6 to NPS 10.
   1. Steel Welding Fittings: ASTM A 234/A 234M, and ASME B16.9 or ASME B16.11.
   2. Steel Flanges and Flanged Fittings: ASME B16.5.

2.02 DIELECTRIC FITTINGS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

B. Assembly shall be copper alloy, ferrous, and insulating materials with ends matching piping system.

C. Dielectric Unions: Factory-fabricated assembly, designed for 250-psig minimum working pressure at 180 deg F. Include insulating material that isolates dissimilar materials and ends with inside threads according to ASME B1.20.1.

D. Dielectric Flanges: Factory-fabricated companion-flange assembly, for 175-psig minimum working-pressure rating as required for piping system.

E. Dielectric Couplings: Galvanized steel with inert and noncorrosive thermoplastic lining and threaded ends and 300-psig working-pressure rating at 225 deg F.

F. Dielectric Nipples: Electroplated steel or ductile iron with inert and noncorrosive thermoplastic lining, with combination of plain, threaded, or grooved ends and 300-psig working-pressure rating at 230 deg F.

2.03 SPRINKLER SPECIALTY FITTINGS

A. Sprinkler specialty fittings shall be UL listed or FM approved, with 175-psig minimum working-pressure rating, and made of materials compatible with piping.

B. Outlet Specialty Fittings: Mechanical-T and Cross Fittings are prohibited and shall not be used on the project.

C. Sprinkler Drain and Alarm Test Fittings: Bronze, Cast- or ductile-iron body; with threaded or grooved inlet and outlet, test valve, and orifice and sight glass.

D. Sprinkler Inspector's Test Fitting: Bronze, Cast- or ductile-iron housing with threaded or grooved inlet and drain outlet and sight glass.

E. Dry-Pipe and Pre-Action System Fittings: UL listed for dry-pipe service.

F. Flexible, Sprinkler Hose Fittings:
   1. Standard: UL 2443 and FM 1637.
   2. Type: Flexible hose for connection to sprinkler, and with bracket for connection to ceiling grid.
   3. Pressure Rating: 175 psig minimum.
   4. Size: Same as connected piping, for sprinkler.

G. In-Building Riser:
   1. Standard:
      a. UL HKQA.
      b. NFPA 24.
      c. Outlet Connection:
         1) Grooved: AWWA C-606.
         2) Flange: AWWA C-207.
      d. Inlet Connection: AWWA C-900 PVC or Ductile-Iron Pipe.
      e. Material: ASTM A312 Type 304 stainless steel tubing.
      f. Pressure Rating: 200 psig minimum.
      g. Size: 4-inch to 10-inch.
      h. Lengths:
         1) Vertical: Custom 3 feet to 20 feet.
         2) Horizontal: Custom 3 feet to 20 feet.

2.04 LISTED FIRE-PROTECTION VALVES

A. Valves shall be UL listed or FM approved, with 175-psig minimum pressure rating.

B. Ball Valves: Comply with UL 1091, except with ball instead of disc.
   1. NPS 1½ and Smaller: Bronze body with threaded or grooved ends.

2. NPS 2 and NPS 2½: Bronze body with threaded or grooved ends or ductile-iron body with grooved ends.

C. Butterfly Valves: UL 1091.
1. NPS 2½ and Larger: Bronze, cast-iron, or ductile-iron body; wafer type or with flanged or grooved ends. Weather-proof actuator with pre-wired supervisory switches monitoring the valve in the open or closed positions. Maximum 365 psig working pressure.

D. Check Valves NPS 2 and Larger: UL 312, swing type, cast-iron or ductile-iron body with flanged or grooved ends. Up to 365 psig (2517 kPa) maximum working pressure.

E. Gate Valves: UL 262, OS&Y type.
1. NPS 2 and Smaller: Bronze body with threaded ends.
2. NPS 2-1/2 and Larger: Cast-iron or ductile-iron body with flanged ends.

F. Indicating Valves: UL 1091, with integral indicating device and ends matching connecting piping.
1. Indicator: Electrical, 24-Vdc, prewired, 2-circuit, supervisory switch.
2. NPS 2 inch and Smaller: Ball or butterfly valve with bronze body and threaded ends.
3. NPS 2½ inch and Larger: Butterfly valve with cast- or ductile-iron body; wafer type or with flanged or grooved ends.

2.05 BACKFLOW PREVENTERS

A. Double-Check Backflow-Prevention Assemblies:
1. Standard: ASSE 1015.
2. Operation: Continuous-pressure applications, unless otherwise indicated.
3. Pressure Loss: 6 psig maximum, through middle 1/3 of flow range.
4. Body: cast iron with interior lining complying with AWWA C550 or steel with interior lining complying with AWWA C550 for NPS 2½ and larger.
5. End Connections: Flanged or grooved for NPS 8.
6. Configuration: Designed for horizontal or vertical, straight through flow.
7. Accessories:
a. Valves: Outside screw and yoke gate-type with flanged or grooved ends on inlet and outlet of NPS 8.

2.06 SPECIALTY VALVES

A. Sprinkler System Control Valves: UL listed or FM approved, cast- or ductile-iron body with flanged or grooved ends, and 175-psig minimum pressure rating.
1. Riser Check Valves: UL listed or FM approved, designed for vertical or horizontal installation. Include trim sets for drain and pressure gauges. Valve internal components shall be replaceable without removing the valve from the installed position.
2. Commercial Riser: UL listed or FM approved, designed for vertical or horizontal installation. Include trim sets for test/drain with orifice sized for the smallest K-factor in the system, 175 psi pressure relief valve, water flow switch, and pressure gauge.
3. Dry-Pipe Valves: UL 260, differential type; with bronze or brass seat with Nitrile O-ring seals, single-hinge pin, and latch design. Include UL 1486, quick-opening devices, trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment. Minimum required air pressure is 13 psi with low pressure actuator and 300 psig maximum water pressure rating in all sizes. Valve internal components shall be replaceable without removing the valve from the installed position and shall be externally resettable. Valve shall be supplied completely assembled with shutoff valve, pre-set pressure switches and drain kit.
a. Air Compressor: UL 753, fractional horsepower, 120-V ac, 60 Hz, single phase.

b. Air Compressor/Air Maintenance Assembly: Consisting of a tank mounted compressor, air maintenance device, and flexible hoses for installation. Assembly shall be designed to ensure operational air pressure within 30 minutes of discharge.

B. Pressure-Relief Valves: UL Listed and/or FM Approved, brass or bronze, NPS 1/2 or NPS 3/4, 175-psig minimum rating. Include male NPS inlet and female NPS outlet, non-adjustable, and 90-degree-angle pattern design as indicated.
   1. Finish: Rough metal.

C. Automatic Drain Valves: UL 1726, NPS 3/4, ball-check device with threaded ends.

D. Automatic Air Vent:
   1. Description: Automatic air vent that automatically vents trapped air without human intervention.
   2. Standard: UL listed or FM Global approved for use in wet-pipe fire sprinkler systems.
   3. Vents oxygen continuously from system.
   4. Float valve to prevent water discharge.
   5. Minimum Water Working Pressure Rating: 175 psig.

2.07 SPRINKLERS

A. Sprinklers shall be UL listed or FM approved, with 175-psig minimum pressure rating.

B. Automatic Sprinklers: with heat-responsive element complying with the following:
   1. UL 199, for nonresidential applications.

C. Sprinkler Types and Categories: Minimum nominal 1/2-inch orifice for "Intermediate" temperature classification rating, unless otherwise indicated or required by application.
   1. All Sprinklers shall be Quick Response, unless required otherwise.

D. Sprinkler types, features, and options as follows:
   1. Concealed ceiling sprinklers, including cover plate.
   2. Pendent sprinklers.
   3. Quick-response sprinklers.
   4. Sidewall sprinklers.
   5. Sidewall, dry-type sprinklers.

E. Sprinkler Finishes:
   1. Finished ceilings: to match adjacent ceiling.
   2. Exposed: Bronze or Brass.

F. Special Coatings:
   1. Corrosive environments: Nickel-plated Teflon coated.

G. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.
   1. Ceiling Mounting: Chrome, one piece, flat.
   2. Sidewall Mounting: Chrome, one piece, flat.

H. Sprinkler Guards: Wire-cage type, including fastening device for attaching to sprinkler. Sprinkler guards shall be listed, supplied, and approved for use with the sprinkler, by the sprinkler manufacturer.

2.08 FIRE HOSE VALVES

A. Description: UL 668, brass or bronze, 175-psig minimum pressure rating, hose valve for connecting fire hose. Include angle pattern design; female NPS or grooved inlet and male 3.098 x 8 TPI hose outlet; and lugged cap, gasket, and chain. NPS 2½ hose valve threads according to NFPA 1963 and matching local fire department threads.

1. Valve Operation: Nonadjustable type.
2. Finish: Rough metal.

2.09 FIRE VALVE CABINETS

A. Recessed mounted valve cabinet of 20 ga. Steel. Refer to architect for door, fire-resistance rating, and finish requirements. Cabinet must be large enough to accommodate hose valve indicated.

2.10 FIRE DEPARTMENT CONNECTIONS

A. Fire Department Connection: UL Listed and/or FM Approved, in accordance with AHJ requirements. Include caps; 18-inch-high to 36-inch-high, metal escutcheon plate with marking ["STANDPIPE & AUTOSPRK"] ["AUTOSPRK"].

2.11 ALARM DEVICES

A. Alarm-device types shall match piping and equipment connections.

B. Water-Flow Indicator: UL 346, electrical-supervision, paddle-operated-type, water-flow detector with 250-psig pressure rating and designed for horizontal or vertical installation. Include two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-Vac and 0.25 A, 24-Vdc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.

C. Pressure Switch: UL 753, electrical-supervision-type, water-flow switch with retard feature. Include single-pole, double-throw, normally closed contacts and design that operates on rising pressure and signals water flow.

D. Valve Supervisory Switch: UL 753, electrical, single-pole, double-throw switch with normally closed contacts. Include design that signals controlled valve is in other than fully open position.

2.12 PRESSURE GAUGES

A. Description: UL 393, 3-1/2- to 4-1/2-inch-diameter, dial pressure gauge with range of 0 to 300 psig.
   1. Water System Piping: Include caption "WATER" or "AIR/WATER" on dial face.
   2. Air System Piping: Include retard feature and caption "AIR" or "AIR/WATER" on dial face.

PART 3 EXECUTION

3.01 PREPARATION

A. Perform fire-hydrant flow test according to NFPA 13, NFPA 14, and NFPA 291. Use results for system design calculations required in Part 1 "Quality Assurance" Article.

B. Report test results promptly and in a formal written report documenting the results in accordance with NFPA 13, NFPA 14, and NFPA 291.

3.02 EXAMINATION

A. Examine roughing-in for risers and valves to verify actual locations of piping connections before installation.

B. Examine walls and partitions for suitable thicknesses, fire- and smoke-rated construction, framing for hose-station cabinets, and other conditions where hose valve cabinets are to be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.03 SYSTEM APPLICATIONS

A. Wet-Pipe Automatic Sprinkler System: Provided throughout the building except where a dry-pipe or pre-action automatic sprinkler system is required.

B. Dry-Pipe Automatic Sprinkler System: Areas subject to ambient temperatures below 40° F.

3.04 PIPING APPLICATIONS, GENERAL

A. Flanges, flanged fittings, unions, nipples, and transition and special fittings with finish and pressure ratings same as or higher than system's pressure rating may be used in aboveground applications, unless otherwise indicated.

3.05 STANDPIPE SYSTEM PIPING APPLICATIONS

A. Standard-Pressure, Wet Pipe Standpipe System, 175-psig Maximum Working Pressure:
   1. NPS 2½: Threaded-end, black or galvanized, Schedule 40 steel pipe; cast-, duct-, or malleable-iron threaded fittings; and threaded joints.
   2. NPS 2½ to 6: Grooved-end, black, Schedule 10 steel pipe with roll-grooved ends; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.
   3. NPS 8: Plain-end, Schedule 10 steel pipe; steel welding fittings; and welded joints.
   4. NPS 8: Grooved-end, Schedule 10 steel pipe; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.

3.06 SPRINKLER SYSTEM PIPING APPLICATIONS

A. Standard-Pressure, Wet-Pipe Sprinkler System, 175-psig Maximum Working Pressure:
   1. NPS 1 to NPS 2: Threaded-end, black or galvanized, Schedule 40 steel pipe; cast-, duct-, or malleable-iron threaded fittings; and threaded joints.
   2. NPS 2½ to NPS 6: Plain-end, black, Schedule 40 steel pipe; steel welding fittings; and welded joints.
   3. NPS 1 to NPS 2: Grooved-end, black or galvanized, Schedule 40 steel pipe; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.
   4. NPS 2½ to NPS 6: Schedule 10 black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

3.07 VALVE APPLICATIONS

A. Listed Fire-Protection Valves: UL listed and FM approved for applications where required by NFPA 13 and NFPA 14.
   1. Shutoff Duty: Use ball, butterfly, or gate valves.

3.08 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Threaded Joints: Comply with NFPA 13 for pipe thickness and threads. Do not thread pipe with wall thickness less than Schedule 40.

D. Grooved Joints: Assemble joints with listed coupling and gasket, lubricant, and bolts.
   1. Steel Pipe: Roll-groove piping as indicated. Use grooved-end fittings and rigid, grooved-end-pipe couplings, unless otherwise indicated.
   2. Dry-Pipe Systems: Use fittings and gaskets listed for dry-pipe service, including couplings with flush-seal type gaskets.
   3. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified. Gaskets shall be molded and produced by the grooved coupling manufacturer.
   4. Grooved end shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove for proper gasket sealing.

E. Dissimilar-Metal Piping Joints: Construct joints using dielectric fittings compatible with both piping materials.
   1. NPS 2 and Smaller: Use dielectric unions, couplings, or nipples.

2. NPS 2½ to NPS 4: Use dielectric flanges.
3. NPS 6 and Larger: Use dielectric flange insulation kits.

3.09 SERVICE-ENTRANCE PIPING

A. Connect fire-suppression piping to water-service piping of size and in locations indicated for service entrance to building. Refer to Civil contract documents for exterior piping.
   1. Scope of work begins 5 feet outside the exterior wall of the building.
   2. Provide UL Listed stainless steel in-building riser assembly.
   3. Provide applicable pipe restraints in accordance with NFPA 24.

B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water-service piping.

3.10 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.

B. Use approved fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

C. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, sized and located according to NFPA 13.

D. Install sprinkler piping with drains for complete system drainage.

E. Install ball drip valves to drain piping between fire department connections and check valves. Drain to floor drain or outside building to an approved location.

F. Install alarm devices in piping systems.

G. Hangers and Supports: Comply with NFPA 13 for hanger materials and system piping supports installation.

H. Install pressure gauges on risers on both the system side of the system valve and the supply side of the system valve. Include pressure gauges with connection not less than NPS 1/4 and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gauges to permit removal and install where they will not be subject to freezing.

I. Drain dry-pipe sprinkler piping.

J. Pressurize and check dry-pipe sprinkler system piping and air compressors.

K. Fill wet-pipe sprinkler system piping with water.

L. Install sleeves for piping penetrations of fire-resistance and smoke-resistance rated walls, ceilings, and floors.

M. Install sleeve seals for piping penetrations of CMU and concrete walls and slabs.

N. Install pipe escutcheons for piping penetrations of walls, ceilings, and floors.

O. Water-filled piping shall be limited in and coordinated in low voltage, electrical, and IT rooms.

3.11 VALVE INSTALLATION

A. Install listed fire-protection valves, unlisted general-duty valves, specialty valves and trim, controls, and specialties according to NFPA 13 and NFPA 14 and authorities having jurisdiction.

B. Install listed fire-protection shutoff valves supervised-open, located to control sources of water supply except from fire department connections. Install permanent identification signs indicating portion of system controlled by each valve.

C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water supply sources.

D. Specialty Valves:
   1. Riser Check Valves: Install in vertical position for proper direction of flow.
   2. Floor Control Valve Assemblies: Install in exit stair enclosure on the level served. Coordinate location with means of egress components and Architect.
   3. Dry-Pipe and Pre-Action Valves: Install trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.
      a. Install air compressor and compressed-air supply piping.

E. Air Vent:
   1. Provide at least one air vent at high point in each wet-pipe sprinkler system in accordance with NFPA 13 requirements. Connect vent into top of fire sprinkler piping.
   2. Provide at least one air vent at high point of each standpipe in accesible location and piped to an approved drain location.
   3. Provide dielectric union for dissimilar metals, ball valve, and strainer upstream of automatic air vent.

3.12 SPRINKLER APPLICATIONS

A. Where specific types are not indicated, use the following sprinkler types:
   1. Rooms without Ceilings: Bronze or Brass Upright sprinklers.
   2. Concealed sprinklers shall be installed in finished ceilings.
   3. Wall Mounting: Sidewall sprinklers.
   4. IT Rooms other than the MDF and UPS room, unless requested otherwise: Bright White Concealed horizontal sidewall sprinklers.
   5. Spaces Subject to Freezing: Dry pendent sprinklers, or Dry horizontal sidewall sprinklers.
   6. Special Applications: All Sprinkler heads to be Quick Response type, except Extra Hazard Occupancies.
   7. Install sprinkler guards for areas where sprinklers are subject to be inadvertently hit (i.e. gymnasiums, shops, etc.)

3.13 SPRINKLER INSTALLATION

A. Install sprinklers in suspended ceilings in center of acoustical ceiling panels and tiles.

B. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing. Use dry-type sprinklers with water supply from heated space.

C. The sprinkler bulb protector must remain in place until the sprinkler is completely installed and before the system is placed in service. Remove bulb protectors carefully by hand after installation. Do not use any tools to remove bulb protectors.

D. Do not install sprinklers that have been dropped, damaged, or show a visible loss of fluid. Never install sprinklers with cracked bulbs.

3.14 FIRE HOSE VALVE INSTALLATION

A. Install hose connections adjacent to standpipes, unless otherwise indicated.

B. Install freestanding hose connections for access and minimum passage restriction.

C. Install NPS 2½ hose connections.

3.15 FIRE VALVE CABINET INSTALLATION

A. Install recessed hose stations for access and minimum passage restriction.

B. Install NPS 2½hose connections.

C. Install wall-mounting, recessed type fire hose valves in cabinets. Include pipe escutcheons, with finish matching valves, inside cabinet where water-supply piping penetrates cabinet. Install

valves at angle required for connection of fire hose. Cabinets are specified in Division 10 Section "Fire Extinguisher Cabinets."

3.16 FIRE DEPARTMENT CONNECTION INSTALLATION

A. Install wall mount fire department connections surface mounted to exterior wall.

B. Install ball drip valve at each check valve for fire department connection.

C. Pipe ball drip valve to drain to the exterior of the building.

3.17 CONNECTIONS

A. Install piping adjacent to equipment to allow service and maintenance.

B. Connect water-supply piping to fire-suppression piping. Include backflow preventer between potable-water piping and fire-suppression piping.

C. Connect piping to specialty valves, hose valves, specialties, fire department connections, and accessories.

D. Connect compressed-air supply to dry-pipe sprinkler piping.

E. Connect air compressor to the following piping and wiring:
   1. Pressure gauges and controls.
   2. Electrical power system. Electrical receptacles are not an accessible connection. The electrical power shall be hard-wired by a licensed electrician.
   3. Fire alarm devices.

F. Electrical Connections: Power wiring is specified in Division 26.

G. Connect alarm devices to fire alarm.

H. Ground equipment according to Division 26.

I. Connect wiring according to Division 26.

J. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.18 LABELING AND IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.

B. Provide hydraulic design information signs and general information signs at all system risers and control valve assemblies in accordance with NFPA 13.

3.19 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:
   1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
   2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
   3. Energize circuits to electrical equipment and devices.
   4. Start and run air compressors.
   5. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
   6. Flush, test, and inspect standpipe systems according to NFPA 14, "System Acceptance" Chapter 11.
   7. Flush, test, and inspect standpipe systems according to NFPA 20 Chapter 14.
   8. Coordinate with fire alarm tests. Operate as required.
   9. Coordinate with fire-pump tests. Operate as required.

10. Verify that equipment hose threads are same as local fire department equipment.

B. Report test results promptly and in writing to Architect and authorities having jurisdiction.

C. Refer to Division 01 for additional field testing and commissioning requirements and information.

3.20 CLEANING AND PROTECTION

A. Clean dirt and debris from sprinklers.

B. Remove and replace sprinklers with paint other than factory finish.

C. Protect sprinklers from damage until Substantial Completion.

3.21 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain specialty valves. Refer to Division 01.

B. Grooved coupling manufacturer’s factory-trained field representative shall provide on-site training for contractor's field personnel in the proper use of grooving tools and installation of grooved piping products. Factory-trained representative shall periodically review the product installation. Contractor shall remove and replace any improperly installed products.

SECTION 22 0010
GENERAL REQUIREMENTS FOR PLUMBING SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION

A. The General Requirements for Plumbing Work are intended to be complementary to the General Requirements of the Construction Contract.

B. Work Included: Provide complete plumbing systems where shown on the drawings, as specified herein, and as needed for a complete and proper installation.

1.02 QUALITY ASSURANCE AND APPLICABLE STANDARDS

A. Use adequate numbers of skilled workers that are thoroughly trained and experienced in the necessary crafts and are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Without additional cost to the Architect/Engineer/Owner, provide such other labor and materials as are required to complete the work of this Section in accordance with the requirements of governmental agencies having jurisdiction, regardless of whether such materials and associated labor are called for elsewhere in these Contract Documents.

C. Codes: Perform all work in accordance with the latest edition of the following codes:
1. State and city building, fire, plumbing, and mechanical codes.
2. National Electrical Code (NEC)
3. National Fire Protection Association (NFPA)
4. American with Disabilities Act (ADA)
5. Texas Accessibility Standards (TAS)
6. All authorities having jurisdiction.

D. Where conflicts occur between drawings, specifications, and code requirements, the most stringent requirement shall take precedence.

E. Standards: The specifications and standards of the following organizations are by reference made a part of these specifications. All work, unless otherwise indicated, shall comply with the requirements and recommendations wherever applicable:
1. American National Standards Institute (ANSI)
2. Air Conditioning and Refrigeration Institute (ARI)
3. American Gas Association (AGA)
4. American Society for Testing and Materials (ASTM)
5. American Society of Plumbing Engineers (ASPE)
6. American Society of Mechanical Engineers (ASME)
7. American Society of Refrigeration, Heating and Air Conditioning Engineers (ASHRAE)
8. Electrical Testing Laboratories (ETL)
9. National Bureau of Standards (NBS)
10. National Electrical Manufacturer's Association (NEMA)
11. National Fire Protection Association (NFPA)
12. Underwriters Laboratories, Inc. (UL)

F. Electrical Characteristics for Equipment: Equipment of differing electrical characteristics may be furnished provided such equipment is proposed on the “Alternate Manufacturer Evaluation Form”, subsequently approved, and connecting electrical services, circuit breakers, and conduit sizes appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

G. When requested, provide the Owner’s Authorized Representative with manufacturer’s certificate that materials meet or exceed minimum requirements as specified.

1.03 REQUIREMENTS OF REGULATORY AGENCIES

A. The requirements and recommendations of the latest edition of the Occupational Safety and Health Administration (OSHA) Act are by reference made a part of these specifications. All work shall comply with the requirements and recommendations wherever applicable.

1.04 RELATED WORK SPECIFIED ELSEWHERE

A. All Other Sections of Divisions 21, 23, and 26 (as applicable).

B. All other divisions of the contract documents. Refer to each division's specifications and drawings for all requirements

1.05 SUBMITTALS

A. Comply with pertinent provisions of Division 01.

B. Provide Specifications per Division 01 for all submitted alternate equipment.

C. Product Data: Submit the following:
   1. Materials list of items proposed to be provided under Division 22.
   2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements. The term "Compliance" is understood to mean that the Contractor certifies that the submitted equipment will meet or exceed the contract document requirements. Items that do not clearly meet this definition should be identified and explained as required in the following paragraph.
   3. Identify the difference between the specified item or function and the proposed. Explain with enough detail so that the Architect/Engineer/Owner can easily determine that the item complies with the functional intent. List any disadvantages or advantages of the proposed item versus the specified item. Submit technical data sheets and pictures and diagrams to support and clarify. Organize in a clear and concise format. All substitutions shall be approved in writing by Architect/Engineer. The Architect/Engineer’s decision shall be final.
   4. Allow a minimum of ten (10) working days for the review of submittals and each re-submittal.
   5. Compliance with the Contract documents shall be the sole responsibility of the Contractor. Items on equipment that are were not accepted by the Architect/Engineer in writing as an approved equal shall be replaced or revised to comply with the contract documents at the Contractor's expense.
   6. Manufacturer's recommended installation procedures which, when reviewed by the Architect/Engineer, shall become the basis for accepting or rejecting actual installation procedures used on the work.
   7. Sign the submittal as an indication of compliance with the contract documents. Any deviations from the contract documents shall be indicated on the submittal prior to signing. Any deviations not indicated shall be cause for rejection and removal of the non-complying equipment at the Contractor’s expense.

D. See individual specification Sections for submittal requirements of materials and equipment.

E. Resubmittals of rejected submittals shall be limited to one (1) in number. Costs for processing subsequent resubmittals in excess of the first resubmittal, resulting from the Contractor's disregard of Architect/Engineer's primary submittal rejection comments, shall be borne by the Contractor. Costs shall be based on Architect/Engineer's hourly rates as published in their current professional fee schedules and shall also include reimbursable costs for delivery, mailing, and photocopies at direct cost plus fifteen percent (15%).

F. Shop Drawings: Upon written request of the Contractor, the Architect/Engineer will provide directly to the Contractor electronic backgrounds of drawings required to produce shop drawings. The requirements to secure electronic files for shop drawing purposes are the same as for record drawing purposes. See 22 0010, Paragraph 1.15.H.2.

1.06 SUBSTITUTIONS

A. The use of manufacturers' names and catalog numbers followed by the phrase "or equal" is generally used to establish a standard of quality and utility for the specified items and to provide a dimensional reference for construction documents that are drawn to scale.

B. Submittals for "equal" items shall, where applicable, include the following data that are not necessarily required for specified items:
   1. Performance characteristics.
   2. Materials.
   3. Finish.
   4. Certification of conformance with specified codes and standards.
   5. Manufacturer's specifications and other data needed to prove compliance with the specified requirements. The term "Compliance" is understood to mean that the Contractor certifies that the submitted equipment will meet or exceed the contract document requirements. Items that do not clearly meet this definition should be identified and explained as required in Paragraph 6 below.
   6. Identify the difference between the specified item or function and the proposed. Explain with enough detail so that the Architect/ Engineer/Owner can easily determine that the item complies with the functional intent. List any disadvantages or advantages of the proposed item versus the specified item. Submit technical data sheets and pictures and diagrams to support and clarify. Include shop drawings for all piping and ductwork equipment per Paragraph 1.5 Submittals. Organize in a clear and concise format.

C. Submittals of "equal" components or systems may be rejected if:
   1. The material or equipment would necessitate the alteration of any portion of the mechanical, electrical, architectural or structural design.
   2. Dimensions vary from the specified material or equipment in such a manner that accessibility or clearances are impaired or the work of other trades is adversely affected.

D. Proposed substitutions for materials or equipment must be submitted ten (10) days prior to final bid date for consideration as approved equals. Otherwise, such substitutions will not be permitted. Only Prime Bidders are allowed to make proposals for substitutions. Manufacturers, distributors, and sub-contractors shall not make proposals to the Architect/Engineer for substitutions.

E. No substitution shall be made unless authorized in writing by the Architect/Engineer. Should a substitution be accepted, and should the substitute material prove defective or otherwise unsatisfactory for the service intended, and within the guarantee period, replace this material or equipment with material or equipment specified, at no additional cost to the Architect/Engineer/Owner, and to the satisfaction of the Architect/Engineer.

F. Contractors submitting bids on substitute materials and equipment must also provide a written performance guarantee certifying that the substitute materials and equipment will produce the specified effects and meet the approval of the Architect/Engineer.

1.07 ORDINANCES, PERMITS, METERS, UTILITIES, AND ROYALTIES

A. Procure all permits and licenses necessary for completion of this project and pay all lawful fees required and necessary pursuant in obtaining said permits and licenses. All required certificates of approvals and inspections by local governing and regulating authorities shall be obtained and paid for by the Contractor.

B. Pay all fees required for the connection of water, gas, and sewer to utility mains, and any meter fees if required.
   1. Pay any royalty payments required or fees for the use of patented equipment or systems. Defend all law suits or claims for infringement of any patent rights and shall hold the Owner and Architect/Engineer harmless from loss as a result of said suits or claims.

1.08 COMPATIBILITY OF EQUIPMENT

A. Assume full responsibility for satisfactory operation of all component parts of the mechanical systems to assure compatibility of all equipment and performance of the integrated systems in accordance with the requirements of the specifications. Should the Contractor consider any part of the specifications or drawings as rendering his acceptance of such responsibility impossible, prohibitive, or restrictive, he shall notify the Architect/Engineer before submitting his bid, and the bid shall be accompanied by a written statement of any objections or exceptions to the specifications and drawings.

1.09 EXISTING UTILITIES AND TEMPORARY SERVICES FOR CONSTRUCTION

A. Verify the location and capacity of existing utility services pertaining to work of Division 23. Relocate existing utilities unearthed by excavation as directed by the utility service companies affected.

B. Temporary Services for Construction
   1. Provide temporary services in strict accordance with the provisions of these specifications.

1.10 EXCAVATION AND BACKFILLING

A. Perform all excavation and backfilling necessary for the installation of the work. This shall include shoring and pumping in ditches to keep them in dry condition until the work has been installed. Properly perform all shoring required to protect the excavation and to safeguard employees.

B. Perform excavation and backfilling in strict accordance with the provisions of these specifications including trench safety requirements.

C. Make all excavations to the proper depth, with allowances made for floor slabs, forms, beams, etc. Properly compact ground under piping before installing piping.
   1. Provide backfilling in strict accordance with issued Geotechnical Engineering Report.

D. Remove from the site excavated materials not suitable and not used in the backfill.

E. Field check and verify the locations of all underground utilities. Avoid disturbing these as far as possible. In the event existing utilities are damaged, repair them at no cost to the Architect/Engineer/Owner.

F. In a lime-stabilized area, fully restore the lime stabilization after the excavation is complete.

G. Replace concrete, curbs, paving, and other surface improvements cut during excavation to their original condition.

1.11 JOBSITE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Include required work to correct conditions detrimental to the timely and proper completion of all Division 22 Work. Do not proceed until unsatisfactory conditions are corrected.

1.12 PREPARATION AND COORDINATION

A. Perform coordination work in strict accordance with provisions of these specifications and the following:
   1. Coordinate as necessary with other trades to assure proper and adequate interface with all work.
   2. Where pipes and other plumbing items are shown in conflict with locations of structural members and other equipment, include labor and materials required for extensions, offsets and supports to clear the encroachment.
   3. Although such work is not specifically indicated, provide all supplementary or miscellaneous items, appurtenances, and devices incidental to or necessary for a sound, secure, and complete installation.

4. Coordinate accepted equipment changes from those scheduled or specified with other trades affected. Additional compensation to other trades for equipment changes is the responsibility of the Contractor making the change.

B. Plumbing Drawings are diagrammatic. Follow the drawings as closely as actual construction and work of other trades will permit. Piping arrangements have been designed for maximum economy consistent with good practice and other considerations. Install the systems arranged as shown on the drawings, except as otherwise approved in advance by the Architect/Engineer.

C. Data indicated on the Drawings and in these Specifications are as exact as could be secured, but their absolute accuracy is not warranted. The exact locations, distances, levels, and other conditions will be governed by actual construction and the Drawings and Specifications should be used only for guidance in such regard.

D. Where items such as switches, valve boxes, control panels, etc. are not specifically located on the Drawings, provide an RFI to the Architect/Engineer, and locate as determined in the field by the Architect/Engineer. Where such items are installed without such specific direction, relocate as directed by the Architect/Engineer, and at no additional cost to the Architect/Engineer/Owner.

E. Verify all dimensions and distances. No additional compensation will be allowed because of differences between work shown on the Drawings and actual dimensions and distances at the jobsite.

1.13 CONSTRUCTION REQUIREMENTS

A. The drawings show the arrangements of work. Should project conditions necessitate rearrangement, or if the materials or equipment can be installed to a better advantage in a different manner, before proceeding with the work, prepare and submit Drawings of the proposed arrangement for the Architect/Engineer's review. Allow a minimum of ten (10) working days for review.

B. Should the Contractor propose to install equipment requiring space conditions other than those shown, or rearrange the equipment, he shall assume responsibility for the rearrangement of the space and shall have the Architect/Engineer review the change before proceeding with the work. The request for such changes shall be accompanied by contractor-generated detailed shop drawings of the space in question. Identify monetary credits proposed or other benefits of the change. Allow a minimum of ten (10) working days for review.

C. Properly locate and size all slots, holes, and openings in the building structure pertaining to the work and for the correct location of pipe sleeves, as applicable to the work.

1.14 CUTTING AND PATCHING

A. Perform cutting and patching associated with the work in strict accordance with the provisions of Division 01 of these Specifications and the following:
   1. Coordinate work to minimize cutting and patching work.
   2. Request for Architect/Engineer's Consent
      a. Prior to cutting or coring of the building structure, submit a written request to the Architect/Engineer for permission to proceed with cutting. Include x-rays of any floor area where cutting or coring is proposed.
      b. Contractor is cautioned that concrete floor may contain steel tendons, pipes, and electrical/telecom conduits, all of which can not be cut or damaged.
   3. Perform Architect/Engineer-approved cutting and demolition by methods that will prevent damage to other portions of the work and provide proper surfaces to receive installation of new work and repair.
   4. Perform fitting and adjusting of products to provide finished installation complying with the specified tolerances and finishes.

5. Provide all core drilling of holes. Where sleeves and blockouts are required, they shall be cut or provided at locations required. On completion of this work or as work progresses, make all repairs and do all patching required as a result of work under this Contract. All patching shall be performed in a manner that will restore the surrounding work to its original condition to the satisfaction of the Architect/Engineer.
6. Assume responsibility for the proper size of all sleeves and blockouts in the building structure pertaining to the work and for providing the correct location of pipe sleeves and blockouts.
7. Where openings are cut through masonry walls, provide lintels or structural supports to protect the remaining masonry. Provide adequate support during the cutting operation to prevent any damage to the affected masonry.

1.15 PROJECT RECORD DOCUMENTS

A. Provide the record documents associated with the work of Division 22 in strict accordance with the provisions of these specifications.

B. Throughout progress of the Division 22 Work, maintain an accurate record of changes in the Contract Documents that apply to work of Division 22. Changes shall include all addendums issued during bidding. Maintain an accurate record of the location of mechanical service lines and outlets and all outside utilities.

C. Delegate the responsibility for maintenance of Record Documents to one person on the Contractor's staff as approved by the Architect/Engineer. Submit in writing at the pre-construction conference the name and credentials of the person responsible for record mark-ups and maintenance.

D. Accuracy of Records
   1. Thoroughly coordinate changes within the Record Documents, making adequate and proper entries on each page of Specifications and each sheet of drawings and other documents where such entry is required to show the change properly. Match the symbology and format of the base documents.
   2. Accuracy of records shall be such that a future verification of items shown in the Contract Documents may rely reasonably on information obtained from the approved Project Record Documents.

E. Maintain the job set of Record Documents completely protected from deterioration and from loss and damage until completion of the work and transfer of all recorded data to the final Project Record Documents.

F. Making Entries on Drawings
   1. Using an erasable colored pencil (not ink or indelible pencil), clearly describe the change by graphic line and note as required.
   2. Date all entries.
   3. Call attention to the entry by a "cloud" drawn around the area or areas affected.
   4. In the event of overlapping changes, use different colors for the overlapping changes.
   5. Make entries within 24 hours after receipt of information that the change has occurred.
   6. Maintain the base drawing format and use the same symbology.
   7. Convert field mark-ups to finished CADD record drawings when required in this section.

G. Conversion of Schematic Layouts
   1. In some cases on the drawings, arrangements of ductwork and piping and similar items are shown schematically and are not intended to portray precise physical layout. Determine final physical arrangement subject to the Architect/Engineer's approval. However, design of future modifications of the facility may require accurate information as to the final physical layout of items that are shown only schematically on the drawings.

2. Show on the job set of record drawings, by dimension accurate to within one inch, the centerline of each run of items such as all sleeves and piping, etc., below grade, in walls, or in the concrete slab. A surface mounted device indicates the exact location:
   a. Clearly identify the item by accurate note such as "Chilled Water" and the like.
   b. Show, by symbol or note, the vertical location of the item "under slab," "in ceiling plenum," "exposed," and the like.
   c. Make all identification sufficiently descriptive that it may be related reliably to the specifications.

H. Final Project Record Documents
   1. The purpose of the final Project Record Documents is to provide factual information regarding all aspects of the Work, both concealed and visible, to enable future modification of the Work to proceed without lengthy and expensive site measurement, investigation, and examination.
   2. Provide completed record drawings in PDF and one printed set reproducible of each drawing.
   3. Refer to Division 01 for additional requirements.

1.16 OPERATION AND MAINTENANCE DATA

A. Well before substantial completion, submit two copies of a preliminary draft of the proposed manual(s) to the Architect/Engineer for review and comments. Allow a minimum of ten (10) working days for review.

B. Submit specified number copies of the approved manual to the Architect/Engineer prior to indoctrination of operation and maintenance personnel.

C. Prepare in accordance with the following standards:

Format:	8½" x 11"
Size:	White bond, at least 20 lb. weight
Paper:	Neatly written or printed
Text:	11" in height preferable; bind in with text; foldouts acceptable; larger drawings are acceptable but fold to fit within the Manual and provide a drawing pocket inside rear cover or bind in with text.
Drawings:	Separate each section of the Manual with neatly prepared flysheets briefly describing contents of the ensuing section; flysheets may be in color.
Flysheets:	

Binding:	Use heavy-duty plastic or fiberboard covers with binding mechanism concealed inside the manual; 3-ring binders will be acceptable; all binding is subject to the Architect/ Engineer's approval.
Measurements:	Provide all measurements in U.S. standard units such as feet-and-inches, lbs, and cfm. Where items may be expected to be measured within ten years in accordance with metric formulae, provide additional measurements in the "International System of Units" (SI).

D. Provide front and back covers for each manual, using durable material approved by the Architect/Engineer, and clearly identified on or through the cover with at least the following information:
   1. Name and Address of Work
   2. Name of Contractor
   3. General subject of this manual
   4. Space for approval signature of the Architect/Engineer and approval date

1.17 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Contents: Include at least the following:
   1. Neatly typewritten index near the front of the manual, giving immediate information as to location within the manual of all emergency information regarding the installation.
   2. Complete instructions regarding operation and maintenance of all equipment provided including lubrication, disassembly, and reassembly.
   3. Complete nomenclature of all parts of all equipment.
   4. Complete nomenclature and part number of all replaceable parts, name and address of nearest vendor, and all other data pertinent to procurement procedures.
   5. Copy of all guarantees and warranties issued.
   6. Manufacturer's bulletins, drawings, and descriptive data, clearly indicating the precise items included in this installation and deleting, or otherwise clearly indicating, all manufacturers' data with which this installation is not concerned.
   7. Such other data as required in other sections of these specifications.

1.18 EQUIPMENT FOUNDATIONS

A. Provide equipment foundations associated with the work in accordance with the provisions of these specifications

B. Provide concrete bases for all pad or floor mounted equipment. Bases shall be four inches (4”) high above finished floors or grades (unless otherwise noted) and shall protrude two inches (2”) beyond all sides of equipment and shall have exposed chamfer edges. Construct bases from ready-mixed hardrock concrete, ASTM C94, reinforced with #3 rebar, ASTM A615, Grade 40, at 18” on center each way.

C. Field verify exact location of outdoor pad mounted equipment with the Architect/Engineer. Supply necessary fill and grade site to provide natural drainage away from equipment.

1.19 PAINTING

A. All equipment shall be delivered to the job with suitable factory finish. Should the finish be damaged in transit or during the installation, it shall be finished to match appearance of original finish. All work shall be subject to approval by Architect/Engineer.

1.20 TESTING AND INSPECTION

A. Provide personnel and equipment, make required tests, and secure required approvals from the Architect/Engineer and governmental agencies having jurisdiction.

B. Make written notice to the Architect/Engineer, adequately in advance, of each of the following stages of construction:
   1. When all rough-in is complete, but not covered;
   2. As specified in all Division 22 sections.
   3. At the completion of the work of Division 22.

C. When material or workmanship is found to not comply with the specified requirements, remove the noncomplying items from the job site and replace them with items complying with the specified requirements at no additional cost to the Architect/Engineer/Owner. This shall be performed within 3 days after receipt of written notice of noncompliance.

1.21 WARRANTY

A. Warranty all equipment and workmanship for a period of one year after date of substantial completion and replace or repair any faulty equipment or installation at no cost to the Architect/Engineer/Owner for such service during this period, all in accordance with requirements of Division 01.

B. This warranty shall not void specific warranties issued by manufacturers for greater periods of time. Nor shall it void any rights guaranteed to the Owner by law.

C. Warranties shall be in writing in a form satisfactory to the Owner, and shall be delivered to the Owner before final payment is made.

1.22 PROJECT COMPLETION

A. Upon completion of the work of Division 22, thoroughly clean all exposed portions of the mechanical installation, removing all traces of soil, labels, grease, oil, and other foreign material, and using only the type cleaner recommended by the manufacturer of the item being cleaned.

END OF SECTION

SECTION 22 0517
SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe sleeves.

B. Pipe sleeve-seals.

1.02 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.

1.03 REFERENCE STANDARDS

A. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2022a.

B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2023a.

C. FM (AG) - FM Approval Guide; Current Edition.

D. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified this section.
   1. Minimum three years experience.

C. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store sleeve and sleeve seals in shipping containers, with labeling in place.

B. Provide temporary protective coating on cast iron and steel sleeves if shipped loose.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 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.

B. Sheet Metal: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.

C. Pipe Passing Through Below Grade Exterior Walls:
   1. Zinc coated or cast iron pipe.
   2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.

D. Pipe Passing Through Concrete Beam Flanges, except where Brass Pipe Sleeves are Specified:
   1. Galvanized steel pipe or black iron pipe with asphalt coating.
   2. Connect sleeve with floor plate except in mechanical rooms.

E. Pipe Passing Through Mechanical, Laundry, and Animal Room Floors above Basement:
   1. Galvanized steel pipe or black iron pipe with asphalt coating.
   2. Connect sleeve with floor plate except in mechanical rooms.

F. Penetrations in concrete beam flanges are permitted but are prohibited through ribs or beams without prior approval from the Structural Engineer.

G. Clearances:
   1. Provide allowance for insulated piping.
   2. Wall, Floor, Partitions, and Beam Flanges: 1 inch greater than external pipe diameter.
   3. All Rated Openings: Caulked tight with fire stopping material complying with ASTM E814 in accordance with Section 07 8400 to prevent the spread of fire, smoke, and gases.

2.02 PIPE-SLEEVE SEALS

A. Modular Mechanical Sleeve-Seal:
   1. Elastomer-based interlocking links 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. Corrosion resistant.
      b. Oil, fuel, gas, and solvent resistant.
      c. Underground, buried, and wet conditions.
      d. Fire Resistant: 3 hour, FM (AG) and UL (DIR) approved.
      e. High Temperature, up to 400 degrees F.
      f. Low temperature, down to minus 67 degrees F.
   5. Glass-reinforced plastic pressure end plates.

B. Sealing Compounds:
   1. Provide packing and sealing compound to fill pipe to sleeve thickness.
   2. Combined packing and sealing compounding to match partition fire-resistance hourly rating.

C. Pipe Sleeve Material:
   1. Bearing Walls: Steel, cast iron, or terra-cotta pipe.
   2. Masonry Structures: Sheet metal or fiber.

D. Wall Sleeve: Steel material with waterstop collar, and nailer end-caps.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and foreign material, from inside and outside, before assembly.

3.02 INSTALLATION

A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

B. Install piping to conserve building space, to not interfere with use of space and other work.

C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

D. Inserts:
   1. Provide inserts for placement in concrete formwork.
   2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
   3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
   4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
   5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

E. Structural Considerations: Do not penetrate building structural members unless indicated.

F. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
   1. Underground Piping: Caulk pipe sleeve watertight with lead and oakum or mechanically expandable chloroprene inserts with bitumen sealed metal components.
   2. Aboveground Piping:
      a. Pack solid using mineral fiber complying with ASTM C592.
      b. Fill space with an elastomer caulk to a depth of 0.50 inch where penetrations occur between conditioned and unconditioned spaces.
   3. All Rated Openings: Caulk tight with fire stopping material complying with ASTM E814 in accordance with Section 07 8400 to prevent the spread of fire, smoke, and gases.
   4. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.

G. 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 water-tight seal.
   6. Install in accordance with manufacturer's recommendations.

H. 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.

3.03 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.

C. See Section 01 7419 - Construction Waste Management and Disposal for additional requirements.

END OF SECTION

SECTION 22 0519
METERS AND GAUGES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pressure gauges.

B. Thermometers.

C. Pressure-temperature test plugs.

1.02 REFERENCE STANDARDS

A. ASME B40.100 - Pressure Gauges and Gauge Attachments; 2022.

B. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers; 2014 (Reapproved 2025).

C. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers; 2014 (Reapproved 2021).

D. UL 393 - Indicating Pressure Gauges for Fire-Protection Service; Current Edition, Including All Revisions.

E. UL 404 - Gauges, Indicating Pressure, for Compressed Gas Service; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide red-marked product data sheets for each furnished item with associated components and accessories.

C. Project Record Documents: Record actual locations of components and instrumentation.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements. for additional provisions.
   2. Extra Gauge Oil for Inclined Manometers: One bottle.
   3. Extra Pressure Gauges: One of each type and size.

PART 2 PRODUCTS

2.01 PRESSURE GAUGES

A. Bourdon Tube for Liquids and Gases:
   1. Dial Size and Cover: 4-1/2 inch diameter scale with glass window.
   2. Dial Text and Markings: Black color on white background with scaled psi units.
   3. Accuracy: ASME B40.100, adjustable commercial grade (B) with 2 percent at mid-range of span.
   4. Process Connection: Lower-back, 1/4 inch NPT male except where noted.
   5. Corrossion Resistant Gauge Wetted Materials: Painted steel case and brass socket rated to match process pressure and temperature range.
   6. Comply with UL 393 when used for fire protection service or UL 404 when used for compressed gas service.

B. Accessories:
   1. Air or Gas Sensor: Static pressure with compression fittings for bulkhead mounting and 1/4 inch diameter tubing.
   2. Gauge Cock: Brass with tee or lever handle for maximum 150 psi.
   3. Needle Valve: Brass, 1/4 inch NPT female for noncorrosive service.
   4. Pressure Snubber (Pulsation Damper): Brass, 1/4 inch NPT male.

5. Diaphragm Seal: 316L Stainless steel wetted material rated at 15 psi (1 bar), threaded. Select top size to match gauge size.

2.02 THERMOMETERS

A. General:
   1. Product Compliance: ASTM E1.
   2. Lens: Clear glass, except where stated.
   3. Accuracy: Two percent, when tested in accordance with ASTM E77, except where stated.
   4. Scale: Black markings depicting single scale in degrees F where expected process value falls half-span of standard temperature range.

B. Thermometers - Adjustable Angle: 7 inch v-shape aluminum case with clear glass window scale, 6 inch NPT stem, red or blue organic non-toxic liquid filled glass tube, and adjustable joint with positive locking device allowing 360 degrees in horizontal plane or 180 degrees in vertical plane adjustments.

2.03 PRESSURE-TEMPERATURE TEST PLUGS:

A. Size: 500 psi capacity; 1/2 inch MPT brass fitting with gasket, cap, and retaining strap for 1/8 inch pressure gauge or temperature probe.

B. Wetted Materials per Temperature Range:
   1. Up to 200 degrees F: Brass probe with neoprene core.

C. Accessories: Brass, lever-handle cock and snubber-filter.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports, and test plugs.

3.02 INSTALLATION

A. Install pressure gauges as follows:
   1. At Pumps: Place single gauge before strainer, suction side and discharge side.
   2. Include gauge cock to isolate each gauge and extend nipples for insulation clearance.
   3. Adjust gauges to selected viewing angle, clean thoroughly, and calibrate to zero.

B. Install thermometers as follows:
   1. Water Heaters: Place upstream and downstream of heater. Add one on the inlet end when using steam as the water heating medium.
   2. Piping: Install thermometers in branch butt weld connection fitting or socket-weld thermowell. Enlarge pipes smaller than 2-1/2 inch to accommodate sockets. Ensure sockets are above insulation clearance.

C. Locate PT (pressure-temperature) test plugs adjacent to control device sockets.

END OF SECTION

SECTION 22 0523
GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Angle valves.

B. Ball valves.

C. Butterfly valves.

D. Check valves.

E. Gate valves.

F. Lubricated plug valves.

1.02 RELATED REQUIREMENTS

1.03 ABBREVIATIONS AND ACRONYMS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Non-rising stem.

E. OS&Y: Outside screw and yoke.

F. PTFE: Polytetrafluoroethylene.

G. RS: Rising stem.

H. TFE: Tetrafluoroethylene.

I. WOG: Water, oil, and gas.

1.04 REFERENCE STANDARDS

A. ASME B1.20.1 - Pipe Threads, General Purpose, Inch; 2013 (Reaffirmed 2018).

B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2026.

C. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24 Metric/Inch Standard; 2025.

D. ASME B16.10 - Face-to-Face and End-to-End Dimensions of Valves; 2022, with Errata (2023).

E. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.

F. ASME B16.34 - Valves — Flanged, Threaded, and Welding End; 2025.

G. ASME B31.9 - Building Services Piping; 2025.

H. 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; 2025, with Errata.

I. ASTM A48/A48M - Standard Specification for Gray Iron Castings; 2022.

J. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings; 2004 (Reapproved 2023).

K. ASTM A536 - Standard Specification for Ductile Iron Castings; 2024.

L. MSS SP-67 - Butterfly Valves; 2022.

M. MSS SP-70 - Gray Iron Gate Valves, Flanged and Threaded Ends; 2011.

N. MSS SP-71 - Gray Iron Swing Check Valves, Flanged and Threaded Ends; 2018.

O. MSS SP-72 - Ball Valves with Flanged or Butt-Welding Ends for General Service; 2010a.

P. MSS SP-78 - Gray Iron Plug Valves, Flanged and Threaded Ends; 2011.

Q. MSS SP-80 - Bronze Gate, Globe, Angle, and Check Valves; 2019.

R. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .

S. NSF 61 - Drinking Water System Components - Health Effects; 2025, with Addendum

T. NSF 372 - Drinking Water System Components - Lead Content; 2024.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

C. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listings.

E. Maintenance Materials: Furnish Owner with one wrench for every five plug valves, in each size of square plug valve head.
   1. See Section 01 6000 - Product Requirements for additional provisions.

1.06 QUALITY ASSURANCE

A. Manufacturer:
   1. Obtain valves for each valve type from single manufacturer.
   2. Company must specialize in manufacturing products specified in this section, with not less than three years of documented experience.

B. Welding Materials and Procedures: Comply with ASME BPVC-IX.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
   1. Minimize exposure of operable surfaces by setting plug and ball valves to open position.
   2. Protect valve parts exposed to piped medium against rust and corrosion.
   3. Protect valve piping connections such as grooves, weld ends, threads, and flange faces.
   4. Adjust globe, gate, and angle valves to the closed position to avoid clattering.
   5. Secure check valves in either the closed position or open position.
   6. Adjust butterfly valves to closed or partially closed position.

B. Use the following precautions during storage:
   1. Maintain valve end protection and protect flanges and specialties from dirt.
      a. Provide temporary inlet and outlet caps.
      b. Maintain caps in place until installation.
   2. Store valves in shipping containers and maintain in place until installation.
      a. Store valves indoors in dry environment.
      b. Store valves off the ground in watertight enclosures when indoor storage is not an option.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. See drawings for specific valve locations.

B. Listed pipe sizes shown using nominal pipe sizes (NPS) and nominal diameter (DN).

C. Provide the following valves for the applications if not indicated on drawings:
   1. Shutoff: Ball, butterfly, gate.
   2. Dead-End: Single-flange butterfly (lug) type.
   3. Swing Check (Pump Outlet):
      a. 2 inch and Smaller: Bronze swing check valves with bronze or nonmetallic disc.
      b. 2-1/2 inch and Larger for Domestic Water: Iron swing check valves with closure control, metal or resilient seat check valves.

D. Substitutions of valves with higher CWP classes or WSP ratings for same valve types are permitted when specified CWP ratings or WSP classes are not available.

E. Domestic, Hot and Cold Water Valves:
   1. 2 inch and Smaller:
      a. Bronze: Provide with solder-joint, threaded, or press ends.
      b. Bronze Angle: Class 125, bronze disc.
      c. Ball: Two piece, full port, bronze with stainless-steel trim.
      d. Bronze Swing Check: Class 125, bronze disc.
      e. Bronze Gate: Class 125, NRS.
   2. 2-1/2 inch and Larger:
      a. Iron, 2-1/2 inch to 4 inch: Provide with threaded, flanged, or press ends.
      b. Iron Ball: Class 150.
      c. Iron Single-Flange Butterfly: 200 CWP, EPDM seat, aluminum-bronze disc.
      d. Iron Swing Check: Class 125, metal seats.
      e. Iron Gate: Class 125, NRS.

F. Natural Gas Valves:
   1. 4 inch and Smaller:
      a. Ball: Two piece, full port, bronze with brass trim.
      b. Plug: Cast iron body and plug.

2.02 GENERAL REQUIREMENTS

A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.

B. Valve Sizes: Match upstream piping unless otherwise indicated.

C. Valve Actuator Types:
   1. Gear Actuator: Quarter-turn valves 8 inch and larger.
   2. Handwheel: Valves other than quarter-turn types.
   3. Hand Lever: Quarter-turn valves 6 inch and smaller except plug valves.
   4. Wrench: Plug valves with square heads.

D. Insulated Piping Valves: With 2 inch stem extensions and the following features:
   1. Gate Valves: Rising stem.
   2. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
   3. Butterfly Valves: Extended neck.
   4. Memory Stops: Fully adjustable after insulation is installed.

E. Valve-End Connections:
   1. Threaded End Valves: ASME B1.20.1.
   2. Flanges on Iron Valves: ASME B16.1 for flanges on iron valves.
   3. Pipe Flanges and Flanged Fittings 1/2 inch through 24 inch: ASME B16.5.
   4. Solder Joint Connections: ASME B16.18.

F. General ASME Compliance:
   1. Ferrous Valve Dimensions and Design Criteria: ASME B16.10 and ASME B16.34.
   2. Solder-joint Connections: ASME B16.18.
   3. Building Services Piping Valves: ASME B31.9.

G. Potable Water Use:
   1. Certified: Approved for use in compliance with NSF 61 and NSF 372.
   2. Lead-Free Certified: Wetted surface material includes less than 0.25 percent lead content.

H. Source Limitations: Obtain each valve type from a single manufacturer.

2.03 BRONZE, ANGLE VALVES

A. Class 125; CWP Rating: 200 psi:
   1. Comply with MSS SP-80, Type 1.
   2. Body: Bronze; ASTM B62, with integral seat and screw in bonnet.
   3. End Connections: Pipe thread.
   4. Stem: Bronze.
   5. Disc: Bronze.
   6. Packing: Asbestos free.
   7. Handwheel: Bronze or aluminum.

2.04 BRONZE, BALL VALVES

A. General:
   1. Fabricate from dezincification resistant material.
   2. Copper alloys containing more than 15 percent zinc are not permitted.

B. Two Piece, Full Port with Bronze Trim:
   1. Comply with MSS SP-110.
   2. WSP Rating: 150 psi.
   3. WOG Rating: 600 psi.
   4. Body: Forged bronze or dezincified-brass alloy.
   5. Ends Connections: Pipe thread or solder.
   6. Seats: PTFE.
   7. Stem: Bronze, blowout proof.
   8. Ball: Chrome plated brass.
   9. Operator: Provide lockable handle and stem extension.

2.05 IRON, BALL VALVES

A. Class 125, Full Port, Stainless Steel Trim:
   1. Comply with MSS SP-72.
   2. CWP Rating: 200 psi.
   3. Body: ASTM A536 Grade 65-45-12, ductile iron.
   4. End Connections: Flanged.
   5. Seats: PTFE.
   6. Stem: Stainless steel.
   7. Ball: Stainless steel.
   8. Operator: Lever with locking handle.

2.06 IRON, SINGLE FLANGE BUTTERFLY VALVES

A. Wafer and Lug Style:
   1. Class 125, or Class 150 flanges.
   2. Comply with MSS SP-67, Type I.
   3. Wafer Style, Service Pressure Ratings:

a. 2 to 12 inch: 200 psi.
b. 14 to 24 inch: 150 psi.
c. Vacuum down to 29.9 in-Hg.

4. Body Material: ASTM A126, cast iron or ASTM A536, ductile iron.
5. Stem: One or two-piece stainless steel.
6. Seat: EPDM.
7. Disc: Aluminum-bronze.
8. Finish: Epoxy coated.
9. Operator: Lockable handle over direct-mount actuator base.

2.07 BRONZE, SWING CHECK VALVES

A. General:
1. Fabricate from dezincification resistant material.
2. Copper alloys containing more than 15 percent zinc are not permitted.

B. Class 125:
1. Pressure and Temperature Rating: MSS SP-80, Type 3.
2. Design: Y-pattern, horizontal or vertical flow.
3. WOG Rating: 200 psi.
4. Body: Bronze.
5. End Connections: Threaded or soldered.
6. Disc: Bronze.

2.08 IRON, HORIZONTAL SWING CHECK VALVES

A. Class 125:
1. Pressure and Temperature Rating: MSS SP-71, Type I.
2. Design: T-body style for clear or full waterways.
3. WOG Rating: 200 psi.
4. Body: ASTM A126, gray cast iron with bolted bonnet.
5. End Connections: Flanged.
6. Trim: Composition.
7. Seat Ring and Disc Holder: Bronze.
8. Disc: PTFE.
9. Gasket: Asbestos free.

2.09 IRON, SWING CHECK VALVES WITH CLOSURE CONTROL

A. Class 125 with Lever and Spring-Closure Control.
1. Comply with MSS SP-71, Type I.
2. Description:
a. CWP Rating: 200 psi.
b. Design: Clear or full waterway.
c. Body: ASTM A126, gray iron with bolted bonnet.
d. Ends: Flanged as indicated.
e. Trim: Bronze.
f. Gasket: Asbestos free.
g. Closer Control: Factory installed, exterior lever, and weight.

2.10 BRONZE, GATE VALVES

A. General:
1. Fabricate from dezincification resistant material.
2. Copper alloys containing more than 15 percent zinc are not permitted.

B. Rising Stem or OS&Y:

1. Pressure-Temperature Range: MSS SP-80, Type I.
2. Body: Bronze with integral seat and screw-in bonnet.
3. End Connections: Threaded or solder.
4. Stem: Bronze.
5. Disc: Solid wedge; bronze.
6. Packing: Asbestos free.
7. Handwheel Operator: Malleable iron.

2.11 IRON, GATE VALVES

A. Bolted Bonnet: OS&Y; Rising Stem:
1. Pressure and Temperature Rating: MSS SP-70, Type I.
2. Class 125: WOG Rating; 200 psi.
3. Body: ASTM A126, gray iron with bolted bonnet.
4. End Connections: Flanged.
5. Trim: Bronze.
6. Disc: Solid wedge.
7. Packing and Gasket: Asbestos free.

2.12 LUBRICATED PLUG VALVES

A. Regular Gland with Threaded Ends:
1. Comply with MSS SP-78, Type II.
2. Class 125: CWP Rating: 200 psi.
3. Body: ASTM A48/A48M or ASTM A126, cast iron with lubrication sealing system.
4. Pattern: Regular or short.
5. Plug: Cast iron or bronze with sealant groove.
6. Packing: Teflon or Buna N

PART 3 EXECUTION

3.01 EXAMINATION

A. Discard all packing materials and verify that valve interior, including threads and flanges are completely clean without signs of damage or degradation that could result in leakage.

B. Verify valve parts to be fully operational in all positions from closed to fully open.

C. Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.

D. Should valve is determined to be defective, replace with new valve.

3.02 INSTALLATION

A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.

B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.

C. Where valve support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.

D. Install check valves where necessary to maintain direction of flow as follows:
1. Lift Check: Install with stem plumb and vertical.
2. Swing Check: Install horizontal maintaining hinge pin level.

END OF SECTION

SECTION 22 0529
HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Prefabricated trapeze-framed systems.

B. Strut systems for pipe or equipment support.

C. Beam clamps.

D. Pipe hangers.

E. Pipe rollers and roller supports.

F. Pipe supports, guides, shields, and saddles.

G. Nonpenetrating rooftop supports for low-slope roofs.

H. Anchors and fasteners.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 05 5000 - Metal Fabrications.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

B. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.

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; 2025.

D. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2024.

E. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2022).

F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.

G. 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; 2025.

H. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.

J. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.

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; 2025.

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.

1.04 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 3000.

1.05 SUBMITTALS

A. See Section 01 3000 - 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.

D. Installer's Qualifications: Include evidence of compliance with specified requirements.

1.06 QUALITY ASSURANCE

A. Comply with applicable building code.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Installer Qualifications for Field-Welding: As specified in Section 05 5000.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 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. Fire Resistance: Provide hardware rated for 60 minutes resistance unless specifically indicated by the authority having jurisdiction.

F. Materials for Metal Fabricated Supports: Comply with Section 05 5000.
   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.

G. Corrosion Resistance: Use corrosion-resistant metal-based materials fully compatible with exposed piping materials and suitable for the environment where installed.
   1. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
   2. Outdoor, Damp, or Wet-Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.

2.02 PREFABRICATED TRAPEZE-FRAMED SYSTEMS

A. 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 zinc-plated steel or galvanized steel.
      b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
   3. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch.
   4. Minimum Channel Dimensions: 1-5/8 inch width by 13/16 inch height.
   5. Accessories: Provide bracket covers, cable basket clips, cable tray clips, clamps, conduit clamps, fire-retarding brackets, j-hooks, protectors, and vibration dampeners.

2.03 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.

2.04 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 stainless steel and zinc finish.

C. Small or Junior Beam Clamp: MSS SP-58 type 19, malleable iron with zinc finish. For inverted usage provide manufacturer listed size(s).

D. Wide Mouth Beam Clamp: MSS SP-58 type 19, malleable iron with zinc finish.

E. Centerload Beam Clamp with Extension Piece: MSS SP-58 type 30, malleable iron with zinc finish.

F. FM (AG) and UL (DIR) Approved Beam Clamp: MSS SP-58 type 19, plated 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.

2.05 PIPE HANGERS

A. Clevis Hangers, Adjustable:
   1. Light-Duty: MSS SP-58 type 1, zinc-colored, epoxy plated.
   2. Standard-Duty: MSS SP-58 type 1, zinc-colored, epoxy plated.

2.06 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, 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 zinc 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.

D. Insulation Coupling:
   1. Two bolt-type clamps designed for installation under insulation.
   2. Material: Carbon steel with epoxy copper or zinc finish.

2.07 PIPE ROLLERS AND ROLLER SUPPORTS

A. MSS SP-58 type 43 based on required load, nonconductive and corrosion resistant.

B. Material: Zinc plated ASTM A36/A36M carbon steel or ASTM A47/A47M malleable iron.

2.08 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. U-Bolts:

1. MSS SP-58 type 24, carbon steel u-bolt for pipe support or anchoring.

C. Intermediate Anchors and Pipe Alignment Guides:
   1. Pipe Sizes 6 inch and Smaller: Minimum clearance of 0.16 inch.
   2. Pipe Size 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 inches: 1 inch U-bolt.
   6. Use pipe clamps with oversize pipe sleeve that provides clearance around pipe.

D. 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.

E. 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.

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 clamps.
      b. Support From Below: MSS SP-58 types 35 through 38.

G. 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.

2.09 NONPENETRATING ROOFTOP SUPPORTS FOR LOW-SLOPE ROOFS

A. Provide steel pedestals with thermoplastic or rubber base that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified.

B. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.

C. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.

D. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.

2.10 ANCHORS AND FASTENERS

A. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.

B. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.

C. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.

D. Hollow Masonry: Use toggle bolts.

E. Hollow Stud Walls: Use toggle bolts.

F. Steel: Use beam ceiling clamps, beam clamps, machine bolts, or welded threaded studs.

G. Beam Ceiling Flanges: ASTM A47/A47M Grade 32510, malleable iron or stainless steel with copper, stainless steel, or zinc finish.

H. Sheet Metal: Use sheet metal screws.

I. Wood: Use wood screws.

J. Plastic and lead anchors are not permitted.

K. Powder-actuated fasteners are not permitted.

L. Hammer-driven anchors and fasteners are not permitted.

M. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

N. Preset Concrete Inserts: Continuous metal strut channel and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
   1. Channel Material: Use galvanized steel.
   2. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch minimum base metal thickness.
   3. Manufacturer: Same as manufacturer of metal strut channel framing system.

PART 3 EXECUTION

3.01 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.

3.02 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. Field-Welding (where approved by Architect): Comply with Section 05 5000.

H. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.

I. 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 4 inch high concrete pad constructed in accordance with Section 03 3000.
   5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

J. Preset Concrete Inserts: Use manufacturer-provided closure strips to inhibit concrete seepage during concrete pour.

K. Secure fasteners according to manufacturer's recommended torque settings.

L. Remove temporary supports.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - 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 22 0548
VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Vibration isolation requirements.

B. Vibration-isolated equipment support bases.

C. Vibration isolators.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate selection and arrangement of vibration isolation and/or seismic control components with the actual equipment 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. 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 3000.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Design Documents: Prepare and submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, details, and calculations.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.
   1. Vibration Isolators: Include rated load capacities and deflections; include information on color coding or other identification methods for spring element load capacities.

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.

1.06 QUALITY ASSURANCE

A. Comply with applicable building code.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 VIBRATION ISOLATION REQUIREMENTS

A. Design and provide vibration isolation systems to reduce vibration transmission to supporting structure from vibration-producing plumbing equipment and/or plumbing connections to vibration-isolated equipment.

B. Comply with applicable general recommendations of ASHRAE (HVACA), where not in conflict with other specified requirements:

C. General Requirements:
   1. Select vibration isolators to provide required static deflection.
   2. Select vibration isolators for uniform deflection based on distributed operating weight of actual installed equipment.
   3. Select vibration-isolated equipment support bases and associated vibration isolators to provide minimum 2-inch operating clearance beneath base unless otherwise indicated.

D. Piping Isolation:
   1. Provide vibration isolators for piping supports:
      a. Located in equipment rooms.
      b. Located within 50 feet of connected vibration-isolated equipment and pressure-regulating valve (PRV) stations.
      c. For piping over 2 inch located below or within 50 feet of noise-sensitive areas indicated.
   2. Minimum Static Deflection:
      a. First Three Supports Closest to Isolated Equipment: Same as static deflection of equipment; maximum of 2 inch deflection required.
      b. Remainder of Supports: 0.75 inch deflection unless otherwise indicated.
   3. Suspended Piping, Nonseismic Applications: Use resilient material isolator hangers, spring isolator hangers, or combination resilient material/spring isolator hangers.
   4. Floor-Mounted Piping, Nonseismic Applications: Use open (unhoused) spring isolators.
   5. Use modular seal or approved resilient material where vibration-isolated piping penetrates building elements (e.g., walls, floors) arranged to prevent vibration transmission to structure.

2.02 VIBRATION-ISOLATED EQUIPMENT SUPPORT BASES

A. Vibration-Isolated Structural Steel Bases:
   1. Description: Engineered structural steel frames with integral mounting provisions for vibration isolators, sized and configured for mounting of equipment.

B. Vibration-Isolated Concrete Inertia Bases:
   1. Description: Concrete-filled engineered steel forms with integral mounting provisions for vibration isolators, sized and configured for mounting of equipment.
   2. Minimum Base Depth: 6 inches.
   3. Minimum Base Mass (Including Concrete): 1.5 times weight of supported equipment.
   4. Concrete Reinforcement: Welded or tied reinforcing bars running both ways in a single layer.
   5. Concrete: Filled on site with minimum 3000 psi concrete in accordance with Section 03 3000.
   6. Pump Applications: Size and configure bases for piping elbow supports as required.

2.03 VIBRATION ISOLATORS

A. General Requirements:
   1. Resilient Materials for Vibration Isolators: Oil, ozone, and oxidant resistant.

2. Spring Elements for Spring Isolators:
   a. Color code or otherwise identify springs to indicate load capacity.
   b. Lateral Stability: Minimum lateral stiffness to vertical stiffness ratio of 0.8.
   c. Designed to operate in the linear portion of their load versus deflection curve over deflection range of not less than 50 percent above specified deflection.
   d. Designed to provide additional travel to solid of not less than 50 percent of rated deflection at rated load.
   e. Selected to provide designed deflection of not less than 75 percent of specified deflection.
   f. Selected to function without undue stress or overloading.

B. Vibration Isolators for Nonseismic Applications:
1. Resilient Material Isolator Pads:
   a. Description: Single or multiple layer pads utilizing elastomeric (e.g., neoprene, rubber) or fiberglass isolator material.
   b. Pad Thickness: As required for specified minimum static deflection; minimum 0.25 inch thickness.
   c. Multiple Layer Pads: Provide bonded, galvanized sheet metal separation plate between each layer.
2. Resilient Material Isolator Mounts, Nonseismic:
   a. Description: Mounting assemblies for bolting equipment to supporting structure utilizing elastomeric (e.g., neoprene, rubber) or fiberglass isolator material; fail-safe type.
3. Open (Unhoused) Spring Isolators:
   a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) without a housing.
   b. Bottom Load Plate: Nonskid, molded, elastomeric isolator material or steel with nonskid elastomeric isolator pad with provisions for bolting to supporting structure as required.
   c. Furnished with integral leveling device for positioning and securing supported equipment.
4. Resilient Material Isolator Hangers, Nonseismic:
   a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing elastomeric (e.g., neoprene, rubber) or fiberglass isolator material for the lower hanger rod connection.
5. Spring Isolator Hangers, Nonseismic:
   a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) in series with an elastomeric element for the lower hanger rod connection.
   b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.
6. Combination Resilient Material/Spring Isolator Hangers, Nonseismic:
   a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) for the lower hanger rod connection and elastomeric (e.g., neoprene, rubber) or fiberglass isolator material for the upper hanger rod connection.
   b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 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. Secure fasteners according to manufacturer's recommended torque settings.

D. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

E. Vibration Isolation Systems:
   1. Vibration-Isolated Equipment Support Bases:
      a. Provide specified minimum clearance beneath base.
   2. Spring Isolators:
      a. Position equipment at operating height; provide temporary blocking as required.
      b. Lift equipment free of isolators prior to lateral repositioning to avoid damage to isolators.
      c. Level equipment by adjusting isolators gradually in sequence to raise equipment uniformly such that excessive weight or stress is not placed on any single isolator.
   3. Isolator Hangers:
      a. Use precompressed isolator hangers where required to facilitate installation and prevent damage to equipment utility connection provisions.
      b. Locate isolator hangers at top of hanger rods in accordance with manufacturer's instructions.
   4. Clean debris from beneath vibration-isolated equipment that could cause short-circuiting of isolation.
   5. Use elastomeric grommets for attachments where required to prevent short-circuiting of isolation.
   6. Adjust isolators to be free of isolation short circuits during normal operation.
   7. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect vibration isolation and/or seismic control components for damage and defects.

C. Vibration Isolation Systems:
   1. Verify isolator static deflections.
   2. Verify required clearance beneath vibration-isolated equipment support bases.
   3. Verify vibration isolation performance during normal operation; investigate sources of isolation short circuits.

D. Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control components.

END OF SECTION

SECTION 22 0553
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Pipe markers.

D. Ceiling tacks.

1.02 RELATED REQUIREMENTS

A. Section 09 9123 - Interior Painting: Identification painting.

1.03 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.

B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2025.

1.04 SUBMITTALS

A. See Section 01 3000 - 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.

C. Product Data: Provide manufacturers catalog literature for each product required.

D. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

E. Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS

2.01 PLUMBING COMPONENT IDENTIFICATION GUIDELINE

A. Nameplates:
   1. Heat exchangers, water heaters, and other heat transfer products.
   2. Control panels, transducers, and other related control equipment products.
   3. Pumps, tanks, filters, water treatment devices, and other plumbing equipment products.

B. Tags:
   1. Manual operated and automated control valves.
   2. Instrumentation, relays, gauges, and other related control equipment products.
   3. Ceiling tacks placed on lay-in ceiling surface to reference plumbing components.

C. Pipe Markers: 3/4 inch diameter and higher.

2.02 NAMEPLATES

A. Description: Laminated piece with up to three lines of text.
   1. Letter Color: White.
   2. Letter Height: 1/4 inch.
   3. Background Color: Black.
   4. Nameplate Material:
      a. Flexible: Vinyl with adhesive backing per ASTM D709.

b. Metal: Brass with center-side holes for screw fastening.

2.03 TAGS

A. Flexible: Adhesive backed Vinyl with engraved black letters on light contrasting background color with up to three lines of text. Minimum tag size 1-1/2 inch in diameter.

B. Metal: Brass, 19 gauge 1-1/2 inch in diameter with smooth edges, stamped letters, and corrosion-resistant ball chain. Up to three lines of text.

C. Valve Tag Chart: Typewritten 12-point letter size list in anodized aluminum frame.

2.04 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.
   1. Pipe Color Coding:
      a. Domestic Hot Water and Hot Water Recirc: Hot Red
      b. Domestic Cold Water: Blue
      c. Natural Gas Piping: Yellow

C. Underground Flexible Marker: Bright-colored continuously printed ribbon tape, minimum 6 inches wide by 4 mil, 0.004 inch thick, manufactured for direct burial service.

D. Identification Scheme, ASME A13.1:
   1. Primary: External Pipe Diameter, Uninsulated or Insulated.
      a. 3/4 to 1-1/4 inches: Use 8 inch field-length with 1/2 inch text height.
      b. 1-1/2 to 2 inches: Use 8 inch field-length with 3/4 inch text height.
      c. 2-1/2 to 6 inches: Use 12 inch field-length with 1-1/4 inch text height.
      d. Over 10 inches: Use 32 inch field-length with 3-1/2 inch text height.

2.05 CEILING TACKS

A. Description: Steel with 3/4 inch diameter color coded head.

B. Color code as follows:
   1. Plumbing Equipment: Yellow.
   2. Plumbing Valves: Green.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive identification products.

B. Prepare surfaces for stencil painting, see Section 09 9123.

3.02 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. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.

E. 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.

F. 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 0719
PLUMBING PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glass fiber insulation.

B. Weather barrier coatings.

C. Jacketing and accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.

1.03 REFERENCE STANDARDS

A. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

B. 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).

C. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2024).

D. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2025.

E. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2023).

F. 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).

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.

H. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.

I. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.07 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.01 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.

2.02 GLASS FIBER INSULATION, PREFORMED

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. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible, with wicking material to transport condensed water to the outside of the system for evaporation to the atmosphere.
   1. K Value: ASTM C177, 0.23 at 75 degrees F.
   2. Maximum Service Temperature: 220 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. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

E. Vapor Barrier Lap Adhesive: Compatible with insulation.

F. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

G. Outdoor Vapor Barrier Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

2.03 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.

2.04 JACKETING AND ACCESSORIES

A. PVC Plastic Jacket:
   1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
      a. Minimum Service Temperature: 0 degrees F.
      b. Maximum Service Temperature: 150 degrees F.
      c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
      d. Thickness: 10 mil, 0.010 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. Finish: Smooth.
   4. Joining: Longitudinal slip joints and 2 inch laps.
   5. Fittings: 0.016 inch thick die-shaped fitting covers with factory-attached protective liner.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 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 pipes to be insulated, insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

E. Glass fiber insulated pipes conveying fluids that are ambient and below ambient temperature:
   1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
   2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

F. 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.

G. 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 Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
   4. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

H. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 07 8400.

I. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with PVC jacket and fitting covers.

J. 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.

K. Buried Piping: Provide factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with one mil, 0.001 inch thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with a polyester film.

L. 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.

3.03 SCHEDULES

A. Plumbing Systems:
   1. Domestic Hot Water Piping:
      a. Preformed Glass Fiber Insulation:
         1) Pipe Size Range: All Sizes.
         2) Thickness: 1-1/2 inch.
   2. Domestic Cold Water Piping:
      a. Preformed Glass Fiber Insulation:
         1) Pipe Size Range: All Sizes.
         2) Thickness: 1 inch.
   3. Roof Drainage Piping Above Grade:
      a. Preformed Glass Fiber Insulation:
         1) Pipe Size Range: All Sizes.
         2) Thickness: 1 inch.
   4. Condensate Piping Located Inside Building:
      a. Preformed Glass Fiber Insulation:
         1) Pipe Size Range: All Sizes.
         2) Thickness: 1 inch.

END OF SECTION

SECTION 22 1005
PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sanitary waste piping, buried within 5 feet of building.
B. Sanitary waste piping, above grade.
C. Grease waste piping, buried.
D. Grease waste piping, above grade.
E. Domestic water piping, buried within 5 feet of building.
F. Domestic water piping, above grade.
G. Storm drainage piping, buried within 5 feet of building.
H. Storm drainage piping, above grade.
I. Natural gas piping, buried.
J. Natural gas piping, above grade.
K. Condensate and Forced Main piping
L. Pipe flanges, unions, and couplings.

1.02 RELATED REQUIREMENTS

A. Section 33 0110.58 - Disinfection of Water Utility Piping Systems.

1.03 REFERENCE STANDARDS

A. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.
B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.
C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.
D. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings: DWV; 2021.
E. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder-Joint Drainage Fittings—DWV; 2022.
F. ASME B31.1 - Power Piping; 2024.
G. ASME B31.9 - Building Services Piping; 2025.
H. 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; 2025, with Errata.
I. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.
J. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2025.
K. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2025.
L. ASTM B32 - Standard Specification for Solder Metal; 2020.
M. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.
N. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.
O. ASTM B306 - Standard Specification for Copper Drainage Tube (DWV); 2020.

P. ASTM B813 - Standard Specification for Water Flushable Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2024.

Q. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2023.

R. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2020a.

S. ASTM C1540 - Standard Specification for Heavy-Duty Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings; 2020.

T. ASTM D2513 - Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings; 2026.

U. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2020 (Reapproved 2024).

V. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2025.

W. ASTM D2683 - Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing; 2020.

X. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2024, with Editorial Revision (2025).

Y. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.

Z. ASTM F876 - Standard Specification for Crosslinked Polyethylene (PEX) Tubing; 2025.

AA. ASTM F877 - Standard Specification for Crosslinked Polyethylene (PEX) Hot- and Cold-Water Distribution Systems; 2025.

BB. 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; 2024.

CC. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2021.

DD. 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.

EE. FM 1680 - Examination 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; 2025.

FF. NSF 61 - Drinking Water System Components - Health Effects; 2025, with Addendum

GG. NSF 372 - Drinking Water System Components - Lead Content; 2024.

HH. 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; 2024.

II. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - 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.

C. Welders' Certificates: Submit certification of welders' compliance with ASME BPVC-IX.

D. Shop Drawings: For non-penetrating rooftop supports, submit detailed layout developed for this project, with design calculations for loadings and spacings.

E. Project Record Documents: Record actual locations of valves.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements for additional provisions.
   2. Valve Repacking Kits: One for each type and size of valve.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

C. Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.

D. Welder Qualifications: Certified in accordance with ASME BPVC-IX.

E. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.07 FIELD CONDITIONS

A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.01 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.

2.02 SANITARY WASTE 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 and ASTM F656 primer.

2.03 SANITARY WASTE PIPING, ABOVE GRADE

A. Cast Iron Pipe: ASTM A74, service weight.
   1. Fittings: Cast iron.
   2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.

B. 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.

C. Copper Tube: ASTM B306, DWV.
   1. Fittings: ASME B16.29, wrought copper, or ASME B16.23, sovent.

2. Joints: ASTM B32, alloy Sn50 solder.

2.04 GREASE WASTE PIPING, BURIED

A. Cast Iron Pipe: CISPI 301, hubless.
   1. Fittings: Cast iron.
   2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.

2.05 GREASE WASTE PIPING, ABOVE GRADE

A. Cast Iron Pipe: ASTM A74, service weight.
   1. Fittings: Cast iron.
   2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.

B. 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.

2.06 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

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.

2.07 DOMESTIC WATER PIPING, ABOVE GRADE

A. BASE BID - 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. ALTERNATE 4 - Cross-Linked Polyethylene (PEX-a) Pipe: ASTM F876 and ASTM F877. (ONLY FOR USE FOR DOMESTIC WATER PIPING LESS THAN 2-INCH).
   1. Manufacturers:
      a. Uponor, Inc
   2. PPI TR-4 Pressure Design Basis:
      a. 160 psig at maximum 73 degrees F.
      b. 100 psig at maximum 180 degrees F.
      c. 80 psig at maximum 200 degrees F.
   3. Pipe: Provide in straight lengths for all pipes route above ceiling / overhead. Coiled pipe is only acceptable for pipes sizes 3/4" and smaller and installed within walls. All horizontal pipe to be provided with horizontal support channel.
   4. Fittings: Brass and engineered polymer (EP) ASTM F1960.
   5. Joints: ASTM F1960 cold-expansion fittings.

2.08 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 and ASTM F656 primer.

2.09 STORM DRAINAGE PIPING, ABOVE GRADE

A. Cast Iron Pipe: ASTM A74 service weight.
   1. Fittings: Cast iron.
   2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.

B. Cast Iron Pipe: CISPI 301, hubless, service weight.
   1. Fittings: Cast iron.
   2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.

2.10 NATURAL GAS PIPING, BURIED

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: ASTM A234/A234M, wrought steel welding type.
   2. Joints: Welded to ASME B31.1.

2.12 CONDENSATE, DRAIN, AND FORCE MAIN PIPING

A. Copper Tube: ASTM B306, DWV.
   1. Fittings: ASME B16.29, wrought copper, or ASME B16.23, sovent.
   2. Joints: ASTM B32, alloy Sn50 solder.

2.13 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. 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.

2.14 LINE PRESSURE REGULATORS AND APPLIANCE REGULATORS INDICATORS

A. Compliance Requirements:
   1. Appliance Regulator: ANSI Z21.18/CSA 6.3.
   2. Line Pressure Regulator: ANSI Z21.80/CSA 6.22.

B. Materials in Contact With Gas:
   1. Housing: Aluminum, steel (free of non-ferrous metals).
   2. Seals and Diaphragms: NBR-based rubber.

C. Maximum Inlet Operating Pressure: Refer to contract drawings.

D. Output Pressure Range:
   1. Line Pressure Regulator: Refer to contract drawings.
   2. Appliance Regulator: Refer to manufacturer's IOM.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 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.

3.03 GENERAL INSTALLATION REQUIREMENTS

A. Install in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom, conserve space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

G. Provide access where valves and fittings are not exposed.

H. Install water piping to ASME B31.9.

I. 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.

J. Sleeve pipes passing through partitions, walls, and floors.

K. 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.

L. Install unions downstream of valves and at equipment or apparatus connections.

M. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

3.04 INSTALLATION REQUIRMENTS FOR CROSS-LINKED POLYETHYLENE (PEX-A) PIPE:

A. Piping Installation:
   1. Install PEX piping system in compliance with the Uponor PEX Piping Systems Design and Installation Manual (PDIM), current edition, and the Uponor PEX Piping Systems Installation Guide, current edition.
   2. PEX shall not be installed in areas within 5feet of UV light.
   3. PEX shall not be installed within 12” of any gas appliance vents.
   4. PEX shall not be installed within 12” of any light fixture.
   5. PEX shall not be installed at connections to or within 24” of domestic water heating equipment. Provide type L copper water tube for these applications. This shall include, but not necessarily be limited to, the following:
      a. gas and electric storage type and tankless water heaters
      b. hot water storage and thermal expansion tanks
      c. hot water circulating pumps
      d. thermostatic mixing valves
   6. All final stub-outs to plumbing fixtures and equipment shall be Type L copper with solder joint or mechanical pressfittings.
   7. Only approved and appropriate firestop materials shall be used with PEX piping.
   8. When transitioning from PEX to other piping materials, follow the appropriate installation instructions for that product.
   9. Install piping in full compliance with manufacturer`s Plumbing Installation Guide.

B. Hangers and Supports Installation:
   1. Install supports suitable for PEX-a piping in compliance with local codes and the Uponor Piping Systems Installation Guide, current edition.

C. Pipe Joint Construction:

1. PEX-a Connections: Install per manufacturer's recommendations. Use manufacturer-recommended cold-expansion tool for ASTM F1960 connections.

D. Field Quality Control:
   1. Do not expose PEX piping to direct sunlight for more than 30 days. If construction delays are encountered, provide cover to portions of piping exposed to direct sunlight.

E. Insulation:
   1. All PEX-a piping is to be insulated. Refer to piping insulation spec section for additional information.

3.05 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. Hydrostatic pressure testing shall be completed in accordance with local codes and the Uponor PEX Piping Systems Design and Installation Manual (PDIM), current edition.

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.

3.06 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Disinfect water distribution system in accordance with local code requirements and the Uponor PEX Piping Systems Design and Installation Manual (PDIM), current edition.

B. Prior to starting work, verify system is complete, flushed, and clean with potable water.

3.07 SERVICE CONNECTIONS

A. Provide new sanitary and storm 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, pressure reducing valve, and sand strainer.

END OF SECTION

SECTION 22 1006
PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Backflow preventers.

B. Double check valve assemblies.

C. Water hammer arrestors.

D. Mixing valves.

E. Relief valves.

F. Air vents.

G. Electronic trap-seal primers.

1.02 REFERENCE STANDARDS

A. ASHRAE Std 135 - BACnet - A Data Communication Protocol for Building Automation and Control Networks; 2024, with Errata (2025).

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. ASSE 1015 - Performance Requirements for Double Check Backflow Prevention Assemblies; 2021.

E. NSF 61 - Drinking Water System Components - Health Effects; 2025, with Addendum

F. NSF 372 - Drinking Water System Components - Lead Content; 2024.

G. PDI-WH 201 - Water Hammer Arresters; 2017.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

C. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.

D. Manufacturer's qualification statement.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements for additional provisions.
   2. Extra Loose Keys for Outside Hose Bibbs: One.
   3. Extra Hose End Vacuum Breakers for Hose Bibbs: One.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept specialties on site in original factory packaging. Inspect for damage.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

2.02 BACKFLOW PREVENTERS

A. Reduced Pressure Backflow Preventer Assembly:
   1. ASSE 1013; low-lead cast bronze 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, and non-threaded vent outlet.
   2. Size: 3/4 to 2 inch assembly with threaded gate valves.
   3. Accessories: Provide air gap fitting, lead-free Y-strainer, and test cocks.

B. 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, pressure monitor, and test cock.

2.03 DOUBLE CHECK-VALVE ASSEMBLIES

A. Double Check Valve Assembly:
   1. Size: 3/4 to 2 inch, NPS assembly with threaded full port ball valves.
   2. Accessories: Provide lead-free Y-strainer.

B. Double Check Valve Assembly:
   1. ASSE 1015 and NSF 61 compliant lead-free 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.

2.04 WATER HAMMER ARRESTORS

A. Water Hammer Arrestors:
   1. Copper construction, piston type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range 34 to 250 degrees F and maximum 250 psi working pressure.

2.05 MIXING VALVES

A. Digitally-Controlled, Thermostatic Master Mixing Valves:
   1. Valve: Chrome-plated cast brass body, stainless steel or copper alloy bellows, integral temperature adjustment.
   2. Network Communications Protocol: BACnet over IP complying with ASHRAE Std 135.
   3. Accessories:
      a. Check valve on inlets.
      b. Volume control shut-off valve on outlet.
      c. Stem thermometer on outlet.
      d. Strainer stop checks on inlets.

2.06 RELIEF VALVES

A. Bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labelled.

2.07 AIR VENTS

A. Manual Type: Short vertical sections of 2 inch diameter pipe to form air chamber, with 1/8 inch brass needle valve at top of chamber.

B. Float Type:
   1. Brass or semi-steel body, copper, polypropylene, or solid non-metallic float, stainless steel valve and valve seat; suitable for system operating temperature and pressure; with isolating valve.
   2. Cast iron body and cover, float, bronze pilot valve mechanism suitable for system operating temperature and pressure; with isolating valve.

C. Washer Type:
   1. Brass with hygroscopic fiber discs, vent ports, adjustable cap for manual shut-off, and integral spring loaded ball check valve.

2.08 ELECTRONIC TRAP-SEAL PRIMERS

A. Description: Enclosed electronic trap seal primer system with timer.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

C. Encase exterior cleanouts in concrete flush with grade.

D. Install floor cleanouts at elevation to accommodate finished floor.

E. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.

F. Pipe relief from backflow preventer to nearest drain.

G. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping.

END OF SECTION

SECTION 22 1119
LABORATORY SAFETY DEVICE SYSTEM

PART 1 – GENERAL

1.01 SECTION INCLUDES:

A. Furnishings and installation of the Laboratory Safety Device System as shown on the Drawings as herein specified.
   1. Each system shall include, but not be limited to, a utility controller panel, solenoid valves, electrical contactor, remote emergency shut off button, gas detector and all interconnections. The Plumbing Contractor shall provide all materials. Installation shall be in accordance with Part 3 and 4 of this section.

1.02 REFERENCE STANDARDS

A. NFPA 70, National Electrical Code.

B. NFPA 72, National Fire Alarm Code.

C. NFPA 90A, Installation of Air conditioning and Ventilation Systems.

D. Americans with Disabilities Act.

E. Uniform Building Codes (UBC).

F. Local and State Building Codes.

G. All requirements of the local Authority Having Jurisdiction.

H. UL61010-1 3rd Edition – Electrical Equipment for Measurement, control and Laboratory Use

1.03 SUBMITTALS:

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on laboratory safety device system including manfacturer's catalog information.
   1. Separate components may be provided in lieu of the specified manufactured system. Including but not limited to enclosures, remote shut off buttons, contactors and solenoid valves. The system shall include all piping, wiring, conduits, and final connections for a complete operational system.

C. Shop Drawings
   1. Include plans, elevations, sections and mounting and attachments details.
   2. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   3. Wiring Diagrams
      a. Detail wiring for signal, power and control wiring

D. Operation and Maintenance Data
   1. Include in Emergency, Operation and Maintenance manuals.
   2. Refer to Division 01 Section “Operation and Maintenance Data”

E. Manufacturer’s recommended detailed installation instructions.

F. Equipment is not to be ordered without approved submittals

1.04 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Provide a manufacturer’s parts warranty covering 3 Years from date of completion.

PART 2 – PRODUCTS

2.01 LABORATORY SAFETY DEVICE SYSTEM:

A. All Products and Devices for a complete Laboratory Safety Device System with all components designed to operate together as a system.
   1. The system shall and be UL listed and labeled.

2.02 UTILITY CONTROLLER:

A. At each science classroom and elsewhere as shown on Drawings, provide a Utility Controller with fascia panel mounted switches to activate remote solenoids and relays to control domestic water and electrical convenience outlets or other indicated services or devices. Utility Controller shall be certified to Underwriter's Laboratory UL61010-1 3rd Edition Standards. Controller shall provide line voltage signals for output circuits. Controller shall provide inputs for remote EPO's. The Controller shall be equipped with an Authority Key Lock that restricts activation and de-activation of output signals to the instructor or educator. Controller shall be provided with a fascia mounted recessed EPO button.

2.03 WATER SOLENOID VALVES:

A. Water solenoid valves shall be NSF apprd. Brass lead free, EPDM seal, 8W 120v 50-60HZ, Normally closed type with an operating pressure of 2-230PSI. Number of solenoids, intended use and pipe sizes are as noted in Equipment Schedule or Drawings.

2.04 ELECTRICAL CONTACTOR:

A. Electrical contactors shall receive signal from utility control panel to govern the electrical power going to the classroom receptacles. Associated circuits shall be ran from the electrical panel, through the contactor to the receptacles. Contactor shall be rated for 20amp service and provide 4 poles in a normally open configuration capable of receiving a 110v 3amp signal. Number of contactors, location, circuit numbers are as noted on the electrical panel schedule or drawings.

2.05 CONTACTOR ENCLOSURE:

A. Enclose contactors in a 16 gauge mild steel type 1 junction box. Ensure junction box is adequate size to accommodate required number of contactors. Locate enclosure above classroom ceiling close to doorway.

2.06 REMOTE PANIC BUTTON:

A. Where shown on Drawings and where classroom size and configuration restricts clear path from work areas to Utility Controller, provide a wall mounted Remote Panic Button. Button shall be red mushroom twist re-set type recessed in a yellow polycarbonate enclosure with a clear lift up protective shield. Button shall be UL listed and provide clear label text "Emergency Power Off". Assembly shall be located as shown on Drawings and as stipulated in Equipment Schedule. Integrate assembly with volt free dry contact input on Controller.

PART 3 – INTERGRATION AND CONFIGERATION

3.01 BUILDING AUTOMATION OR MANAGEMENT SYSTEMS (BMS):

A. Where shown on Drawings, provide low voltage integration wiring from each Controller to connection point on BMS. Controller provides a NO, COM and NC relay output for BAS / BMS integration, the relay will change state in "Alarm". The Controller can accept low voltage signal from Fire Alarm to shutdown utilities in case of fire alarm. Final connection by others. See manufactures instructions.

3.02 SYSTEM CONFIGURATION:

A. Utility Controllers shall be factory configured to the standard configurations and shall be capable of field adjustments to meet specific project modification requirements. Configurations

are limited to DIP switch adjustments on rear of fascia panel without the requirement of additional equipment.

B. Classroom Utilities:
   1. Each utility service with outlets at student work-stations shall be controlled by independent output circuit at the Utility Controller. Control of services can be combined onto one output circuit as indicated on Drawings. Services shall be activated by Controller fascia panel master control switches and the engaging of the authority control key. Activation of utility services shall be restricted to the instructor by means of the authority key lock switch.

C. Time-Out Function:
   1. Each Controller be pre-set to shut down after either 2hrs, 4hrs 8hrs or have this function disabled. This configuration shall be adjusted via the DIP switches on the reverse side of the fascia panel.

D. Panic Alarm Re-Set:
   1. Unless stated elsewhere on Drawings, The Controller shall only re-set from panic alarm after engagement of the authority key on fascia panel and after local panic alarm has been re-set.

E. Fire Alarm Re-set:
   1. Unless stated elsewhere on Drawings, the Utility Controller shall be configured so that continued fire alarm signal to Controller shall prevent re-set.

F. EPO's and Panic Buttons:
   1. Each Controller shall be configured so that pressing remote EPO or Panic Buttons will disable all utilities. If required; Water and Electrical utilities can be configured to stay on in an emergency. Each Controller shall be configured so that Gas services will automatically shut down in all alarm modes.

PART 4 – EXECUTION

4.01 INSTALLATION:

A. Install in accordance with manufacturer's recommendations and instructions. Verify manufacturer's mounting heights to comply with ADA or other standards.

B. Finish and install all devices as shown in Drawings and as specified herein. Where device is to be installed by other trades, furnish and then turn over to appropriate trade for installation.

C. Furnish, install and make final connections to monitoring and remote EPO's and Panic Buttons as indicated on Drawings and specified herein. Furnish and install low voltage and volt free control wiring from Utility Controller to connection point on BMS and Exhaust Fan controller. Final connection by others.

4.02 PLUMBING:

A. Make final connections to all piping systems where indicated by Drawings and specifications.

4.03 ELECTRICAL:

A. Electrical Contractor shall furnish all conduit and wiring, making final wiring connections to all equipment as indicated by Drawings and specifications. Contractor shall be responsible for all system configurations, integration, test and start-up.

4.04 SYSTEM TEST AND START-UP

A. Prior to placing the Utility Controller System into service, perform ALL Start-Up procedures and checklists as stated in Manufacturer's Operations and Maintenance Procedure
   1. Verify that all components and devices comply with manufacturer's requirements and recommendations and that all devices and installations conform to Drawings and specification requirements.

2. Upon completion of ALL Start-Up tests, place the system into service. Complete all warranty registration documents. Submit originals with other project related closeout and O & M documentation. Review all operating procedures with a representative of the owner. Provide all System Authority Keys to the owner's representative.

END OF SECTION

SECTION 22 1123
DOMESTIC WATER PUMPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Circulators.

1.02 RELATED REQUIREMENTS

A. Section 25 3500 - Integrated Automation Instrumentation and Terminal Devices for HVAC.

1.03 REFERENCE STANDARDS

A. ICC (IPC) - International Plumbing Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. NSF 61 - Drinking Water System Components - Health Effects; 2025, with Addendum

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data:
   1. Provide certified pump curve with duty point marked over pump and system operating conditions and NPSH curve and power requirement by pump tag.
   2. Manufacturer's catalog sheets for fixtures, fittings, accessories, and supplies.

C. Shop Drawings: Include dimensions and performance data.

D. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements for additional provisions.
   2. Extra Pump Seals: One of each type and size.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing type of products specified in this section, with minimum three years of documented experience.

B. Certifications: Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc, as suitable for purpose specified and indicated.

C. Identification: Provide pumps with manufacturer's name, model number, and rated capacity identified by permanently attached label.

D. Performance: Ensure pumps 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.

1.06 DELIVERY, STORAGE, AND HANDLING

A. See Section 01 7419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 5-year manufacturer warranty for circulators. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 CIRCULATORS

A. Casing: Bronze with bronze cast impeller, and stainless steel rotor assembly.

B. Shaft: Alloy steel with integral thrust collar and two oil-lubricated bronze sleeve bearings.

C. Mechanical Seal: Carbon rotating against a stationary ceramic seat.

D. Pipe-End Connection: Union connection.

E. Maximum Discharge Pressure: 145 psi.

F. Motor: 1,750 rpm, ECM duty with flexible coupling.

G. Service Temperature Range: Minus 30 to 250 degrees F.

H. Controls: Provide aquastat set for high-temp cutoff, electric plug, and illuminated hand switch.

I. BMS or Other Integrated Automation Link: Provide auxiliary contacts for fault and run status.

J. Accessories: Include inlet-outlet temperature and pressure gauges with 2-way isolation valves.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products with related fittings, and accessories according to manufacturer instructions.

B. Potable and Drinking Water Service: Provide NSF 61 certified; comply with ICC (IPC).

C. Electrical-Driven Pump Work:
   1. Provide electric-motor-driven equipment specified complete with local disconnect switch and control panel with starter, controls, safety devices, and related wiring.
   2. Provide automatic control and protective devices field-wired to interface-related devices required for specified operation.

D. Ensure that small pressure gauges are installed on both upstream and downstream ends.

E. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are nonoverloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

F. Coordinate BAS, BMS, or Integrated Automation linking between unit controller and remote software app or terminal; see Section 25 3500.

3.02 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Operational Tests: Upon completion and sterilization of plumbing systems, conduct operating tests to demonstrate satisfactory, functional, and operating efficiency.

3.03 CLEANING

A. Thoroughly clean plumbing fixtures and equipment.

B. See Section 01 7419 - Construction Waste Management and Disposal for additional requirements.

3.04 PROTECTION

A. Protect installed products from damage due from subsequent construction operations.

B. Repair or replace products damaged before Date of Substantial Completion.

END OF SECTION

SECTION 22 1429
SUMP PUMPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Submersible sump pumps.

1.02 REFERENCE STANDARDS

A. ICC (IPC) - International Plumbing Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. UL (DIR) - Online Certifications Directory; Current Edition.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide certified pump chart or curve with duty point marked over.

C. Shop Drawings: Include dimensions and performance data.

D. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

E. Executed warranty.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with three years minimum of documented experience.

B. Certifications: UL (DIR) listed, classified, and suitable for the purpose specified and indicated.

C. Identification: Provide pumps with manufacturer's name, model number, and rating/capacity identified by permanently attached label.

1.05 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 2-year manufacturer warranty for pumps and related components. Complete forms in Owner's name and register with manufacturer.

C. Submit warranty with related forms completed in Owner's name and registered with manufacturer.

PART 2 PRODUCTS

2.01 SUBMERSIBLE SUMP PUMPS

A. General: Rugged stainless steel and cast iron housing and base with oil-filled motor chamber, ball bearings, and mechanical seal.

B. Impeller: Thermoplastic; open nonclog, stainless steel shaft.

C. Motor: Base mount, enclosed, lubricated oil-free, thermal-overload protected, continuous duty, permanent split capacitor with oil-resistant, three-prong connector, 10 foot power cord.

D. Controls: Integral, chemically-resistant, vertical plated-steel rod float switch. Cycle pump Off/On between 2.5 and 9 inch heights from bottom of pump.

E. Solids Handling Capacity: Pass lint and other small solids up to 1/2 inch in size.

F. Discharge Pipe Size: 2 inch, NPT, female.

G. Maximum Water-Based Effluent Temperature: 120 degrees F.

H. Accessories: Provide full flow swing-type discharge check valve.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products with related fittings and accessories according to manufacturer instructions.

B. Observe and provide incidentals required to complete installation in compliance with ICC (IPC).

3.02 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Operational Tests: Conduct operating tests to demonstrate satisfactory, functional, and operating efficiency.

3.03 CLEANING

A. See Section 01 7419 - Construction Waste Management and Disposal for additional requirements.

3.04 PROTECTION

A. Protect installed products from damage from subsequent construction operations.

END OF SECTION

SECTION 22 4000
PLUMBING FIXTURES

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. NSF 61 - Drinking Water System Components - Health Effects; 2025, with Addendum

B. NSF 372 - Drinking Water System Components - Lead Content; 2024.

C. UL (DIR) - Online Certifications Directory; Current Edition.

1.02 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

C. Manufacturer's Instructions: Indicate installation methods and procedures.

D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Accept fixtures on-site in factory packaging. Inspect for damage.

1.05 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Provide five year manufacturer warranty for all plumbing fixtures.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Refer to contract documents for plumbing fixture specifications.

B. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

C. Water Efficiency: EPA WaterSense label is required for all water closets, urinals, lavatory faucets, and showerheads.

2.02 REGULATORY REQUIREMENTS

A. Comply with applicable codes for installation of plumbing systems.

B. Comply with UL (DIR) requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

B. Verify that electric power is available and of the correct characteristics.

C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.02 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 INSTALLATION

A. Provide chrome-plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.

B. Install components level and plumb.

C. Install and secure fixtures in place with wall supports and bolts.

D. Solidly attach water closets to floor with lag screws. Lead flashing is not intended to hold fixture in place.

3.04 INTERFACE WITH WORK OF OTHER SECTIONS

A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.05 CLEANING

A. Clean plumbing fixtures and equipment.

3.06 PROTECTION

A. Protect installed products from damage due to subsequent construction operations.

B. Do not permit use of fixtures by construction personnel.

C. Repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 23 0010
GENERAL REQUIREMENTS FOR HVAC SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION

A. The General Requirements for Mechanical Work are intended to be complementary to the General Requirements of the Construction Contract.

B. Work Included: Provide complete mechanical systems where shown on the drawings, as specified herein, and as needed for a complete and proper installation including, but not necessarily limited to the following summary of work:
   1. Provide new DDC controls and integrate with the existing building DDC system.
   2. Test & Balance: will be provided by the Owner. Contractor responsibilities to support the Test & Balance effort are contained in Section 23 05 93.
   3. Other items and services required to complete the systems.

1.02 QUALITY ASSURANCE AND APPLICABLE STANDARDS

A. Use adequate numbers of skilled workers that are thoroughly trained and experienced in the necessary crafts and are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Without additional cost to the Architect/Engineer/Owner, provide such other labor and materials as are required to complete the work of this Section in accordance with the requirements of governmental agencies having jurisdiction, regardless of whether such materials and associated labor are called for elsewhere in these Contract Documents.

C. Codes: Perform all work in accordance with the latest edition of the following codes:
   1. State and city building, fire, plumbing, and mechanical codes.
   2. National Electrical Code (NEC)
   3. National Fire Protection Association (NFPA)
   4. American with Disabilities Act (ADA)
   5. Texas Accessibility Standards (TAS)
   6. All authorities having jurisdiction.

D. Where conflicts occur between drawings, specifications, and code requirements, the most stringent requirement shall take precedence.

E. Standards: The specifications and standards of the following organizations are by reference made a part of these specifications. All work, unless otherwise indicated, shall comply with the requirements and recommendations wherever applicable:
   1. American National Standards Institute (ANSI)
   2. Air Conditioning and Refrigeration Institute (ARI)
   3. American Gas Association (AGA)
   4. American Society for Testing and Materials (ASTM)
   5. American Society of Plumbing Engineers (ASPE)
   6. American Society of Mechanical Engineers (ASME)
   7. American Society of Refrigeration, Heating and Air Conditioning Engineers (ASHRAE)
   8. Electrical Testing Laboratories (ETL)
   9. National Bureau of Standards (NBS)
   10. National Electrical Manufacturer's Association (NEMA)
   11. National Fire Protection Association (NFPA)
   12. Sheet Metal and Air Conditioning National Association (SMACNA)
   13. Underwriters Laboratories, Inc. (UL)

F. Electrical Characteristics for Equipment: Equipment of differing electrical characteristics may be furnished provided such equipment is proposed on the “Alternate Manufacturer Evaluation Form”, subsequently approved, and connecting electrical services, circuit breakers, and conduit sizes appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

G. When requested, provide the Owner’s Authorized Representative with manufacturer’s certificate that materials meet or exceed minimum requirements as specified.

1.03 REQUIREMENTS OF REGULATORY AGENCIES

A. The requirements and recommendations of the latest edition of the Occupational Safety and Health Administration (OSHA) Act are by reference made a part of these specifications. All work shall comply with the requirements and recommendations wherever applicable.

1.04 RELATED WORK SPECIFIED ELSEWHERE

A. All Other Sections of Divisions 21, 22, and 26 (as applicable).

B. All other divisions of the contract documents. Refer to each division's specifications and drawings for all requirements

1.05 SUBMITTALS

A. Comply with pertinent provisions of Division 01.

B. Provide Specifications per Division 01 for all submitted alternate equipment.

C. Product Data: Submit the following:
   1. Materials list of items proposed to be provided under Division 23.
   2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements. The term "Compliance" is understood to mean that the Contractor certifies that the submitted equipment will meet or exceed the contract document requirements. Items that do not clearly meet this definition should be identified and explained as required in the following paragraph.
   3. Identify the difference between the specified item or function and the proposed. Explain with enough detail so that the Architect/Engineer/Owner can easily determine that the item complies with the functional intent. List any disadvantages or advantages of the proposed item versus the specified item. Submit technical data sheets and pictures and diagrams to support and clarify. Organize in a clear and concise format. All substitutions shall be approved in writing by Architect/Engineer. The Architect/Engineer’s decision shall be final.
   4. Allow a minimum of ten (10) working days for the review of submittals and each re-submittal.
   5. Compliance with the Contract documents shall be the sole responsibility of the Contractor. Items on equipment that are were not accepted by the Architect/Engineer in writing as an approved equal shall be replaced or revised to comply with the contract documents at the Contractor's expense.
   6. Manufacturer's recommended installation procedures which, when reviewed by the Architect/Engineer, shall become the basis for accepting or rejecting actual installation procedures used on the work.
   7. Sign the submittal as an indication of compliance with the contract documents. Any deviations from the contract documents shall be indicated on the submittal prior to signing. Any deviations not indicated shall be cause for rejection and removal of the non-complying equipment at the Contractor’s expense.

D. See individual specification Sections for submittal requirements of materials and equipment.

E. Resubmittals of rejected submittals shall be limited to one (1) in number. Costs for processing subsequent resubmittals in excess of the first resubmittal, resulting from the Contractor's disregard of Architect/Engineer's primary submittal rejection comments, shall be borne by the

Contractor. Costs shall be based on Architect/Engineer's hourly rates as published in their current professional fee schedules and shall also include reimbursable costs for delivery, mailing, and photocopies at direct cost plus fifteen percent (15%).

F. Shop Drawings: Upon written request of the Contractor, the Architect/Engineer will provide directly to the Contractor electronic backgrounds of drawings required to produce shop drawings. The requirements to secure electronic files for shop drawing purposes are the same as for record drawing purposes. See 230010, Paragraph 1.15.H.2.

1.06 SUBSTITUTIONS

A. The use of manufacturers' names and catalog numbers followed by the phrase "or equal" is generally used to establish a standard of quality and utility for the specified items and to provide a dimensional reference for construction documents that are drawn to scale.

B. Submittals for "equal" items shall, where applicable, include the following data that are not necessarily required for specified items:
   1. Performance characteristics.
   2. Materials.
   3. Finish.
   4. Certification of conformance with specified codes and standards.
   5. Manufacturer's specifications and other data needed to prove compliance with the specified requirements. The term "Compliance" is understood to mean that the Contractor certifies that the submitted equipment will meet or exceed the contract document requirements. Items that do not clearly meet this definition should be identified and explained as required in Paragraph 6 below.
   6. Identify the difference between the specified item or function and the proposed. Explain with enough detail so that the Architect/ Engineer/Owner can easily determine that the item complies with the functional intent. List any disadvantages or advantages of the proposed item versus the specified item. Submit technical data sheets and pictures and diagrams to support and clarify. Include shop drawings for all piping and ductwork equipment per Paragraph 1.5 Submittals. Organize in a clear and concise format.

C. Submittals of "equal" components or systems may be rejected if:
   1. The material or equipment would necessitate the alteration of any portion of the mechanical, electrical, architectural or structural design.
   2. Dimensions vary from the specified material or equipment in such a manner that accessibility or clearances are impaired or the work of other trades is adversely affected.

D. Proposed substitutions for materials or equipment must be submitted ten (10) days prior to final bid date for consideration as approved equals. Otherwise, such substitutions will not be permitted. Only Prime Bidders are allowed to make proposals for substitutions. Manufacturers, distributors, and sub-contractors shall not make proposals to the Architect/Engineer for substitutions.

E. No substitution shall be made unless authorized in writing by the Architect/Engineer. Should a substitution be accepted, and should the substitute material prove defective or otherwise unsatisfactory for the service intended, and within the guarantee period, replace this material or equipment with material or equipment specified, at no additional cost to the Architect/Engineer/Owner, and to the satisfaction of the Architect/Engineer.

F. Contractors submitting bids on substitute materials and equipment must also provide a written performance guarantee certifying that the substitute materials and equipment will produce the specified effects and meet the approval of the Architect/Engineer.

1.07 ORDINANCES, PERMITS, METERS, UTILITIES, AND ROYALTIES

A. Procure all permits and licenses necessary for completion of this project and pay all lawful fees required and necessary pursuant in obtaining said permits and licenses. All required certificates

of approvals and inspections by local governing and regulating authorities shall be obtained and paid for by the Contractor.

B. Pay all fees required for the connection of water, gas, and sewer to utility mains, and any meter fees if required.
   1. Pay any royalty payments required or fees for the use of patented equipment or systems. Defend all law suits or claims for infringement of any patent rights and shall hold the Owner and Architect/Engineer harmless from loss as a result of said suits or claims.

1.08 COMPATIBILITY OF EQUIPMENT

A. Assume full responsibility for satisfactory operation of all component parts of the mechanical systems to assure compatibility of all equipment and performance of the integrated systems in accordance with the requirements of the specifications. Should the Contractor consider any part of the specifications or drawings as rendering his acceptance of such responsibility impossible, prohibitive, or restrictive, he shall notify the Architect/Engineer before submitting his bid, and the bid shall be accompanied by a written statement of any objections or exceptions to the specifications and drawings.

1.09 EXISTING UTILITIES AND TEMPORARY SERVICES FOR CONSTRUCTION

A. Verify the location and capacity of existing utility services pertaining to work of Division 23. Relocate existing utilities unearthed by excavation as directed by the utility service companies affected.

B. Temporary Services for Construction
   1. Provide temporary services in strict accordance with the provisions of these specifications.

1.10 EXCAVATION AND BACKFILLING

A. Perform all excavation and backfilling necessary for the installation of the work. This shall include shoring and pumping in ditches to keep them in dry condition until the work has been installed. Properly perform all shoring required to protect the excavation and to safeguard employees.

B. Perform excavation and backfilling in strict accordance with the provisions of these specifications including trench safety requirements.

C. Make all excavations to the proper depth, with allowances made for floor slabs, forms, beams, etc. Properly compact ground under piping before installing piping.
   1. Provide backfilling with selected soil, free from rocks and debris and pneumatically tamp with 6-inch layers to secure a field density ration of 95 percent as defined by ASTM Designation D698-57T (Proctor Soil Compaction Test).

D. Remove from the site excavated materials not suitable and not used in the backfill.

E. Field check and verify the locations of all underground utilities. Avoid disturbing these as far as possible. In the event existing utilities are damaged, repair them at no cost to the Architect/Engineer/Owner.

F. In a lime-stabilized area, fully restore the lime stabilization after the excavation is complete.

G. Replace concrete, curbs, paving, and other surface improvements cut during excavation to their original condition.

1.11 JOBSITE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Include required work to correct conditions detrimental to the timely and proper completion of all Division 23 Work. Do not proceed until unsatisfactory conditions are corrected.

1.12 PREPARATION AND COORDINATION

A. Perform coordination work in strict accordance with provisions of these specifications and the following:
   1. Coordinate as necessary with other trades to assure proper and adequate interface with all work.
   2. Where ducts, pipes and other mechanical items are shown in conflict with locations of structural members and other equipment, include labor and materials required for extensions, offsets and supports to clear the encroachment.
   3. Although such work is not specifically indicated, provide all supplementary or miscellaneous items, appurtenances, and devices incidental to or necessary for a sound, secure, and complete installation.
   4. Coordinate accepted equipment changes from those scheduled or specified with other trades affected. Additional compensation to other trades for equipment changes is the responsibility of the Contractor making the change.

B. Mechanical Drawings are diagrammatic. Follow the drawings as closely as actual construction and work of other trades will permit. Duct and piping arrangement have been designed for maximum economy consistent with good practice and other considerations. Install the systems arranged as shown on the drawings, except as otherwise approved in advance by the Architect/Engineer.

C. Data indicated on the Drawings and in these Specifications are as exact as could be secured, but their absolute accuracy is not warranted. The exact locations, distances, levels, and other conditions will be governed by actual construction and the Drawings and Specifications should be used only for guidance in such regard.

D. Where items such as diffusers, thermostats, switches, and control panels are not specifically located on the Drawings, provide an RFI to the Architect/Engineer, and locate as determined in the field by the Architect/Engineer. Where such items are installed without such specific direction, relocate as directed by the Architect/Engineer, and at no additional cost to the Architect/Engineer/Owner.

E. Verify all dimensions and distances. No additional compensation will be allowed because of differences between work shown on the Drawings and actual dimensions and distances at the jobsite.

1.13 CONSTRUCTION REQUIREMENTS

A. The drawings show the arrangements of work. Should project conditions necessitate rearrangement, or if the materials or equipment can be installed to a better advantage in a different manner, before proceeding with the work, prepare and submit five copies of Drawings of the proposed arrangement for the Architect/Engineer's review. Allow a minimum of ten (10) working days for review.

B. Should the Contractor propose to install equipment requiring space conditions other than those shown, or rearrange the equipment, he shall assume responsibility for the rearrangement of the space and shall have the Architect/Engineer review the change before proceeding with the work. The request for such changes shall be accompanied by contractor-generated detailed shop drawings of the space in question. Identify monetary credits proposed or other benefits of the change. Allow a minimum of ten (10) working days for review.

C. Properly locate and size all slots, holes, and openings in the building structure pertaining to the work and for the correct location of pipe sleeves, duct sleeves, fire dampers, etc., as applicable to the work.

1.14 CUTTING AND PATCHING

A. Perform cutting and patching associated with the work in strict accordance with the provisions of Division 01 of these Specifications and the following:
   1. Coordinate work to minimize cutting and patching work.
   2. Request for Architect/Engineer's Consent
      a. Prior to cutting or coring of the building structure, submit a written request to the Architect/Engineer for permission to proceed with cutting. Include x-rays of any floor area where cutting or coring is proposed.
      b. Contractor is cautioned that concrete floor may contain steel tendons, pipes, and electrical/telecom conduits, all of which can not be cut or damaged.
   3. Perform Architect/Engineer-approved cutting and demolition by methods that will prevent damage to other portions of the work and provide proper surfaces to receive installation of new work and repair.
   4. Perform fitting and adjusting of products to provide finished installation complying with the specified tolerances and finishes.
   5. Provide all core drilling of holes. Where sleeves and blockouts are required, they shall be cut or provided at locations required. On completion of this work or as work progresses, make all repairs and do all patching required as a result of work under this Contract. All patching shall be performed in a manner that will restore the surrounding work to its original condition to the satisfaction of the Architect/Engineer.
   6. Assume responsibility for the proper size of all sleeves and blockouts in the building structure pertaining to the work and for providing the correct location of pipe sleeves and blockouts.
   7. Where openings are cut through masonry walls, provide lintels or structural supports to protect the remaining masonry. Provide adequate support during the cutting operation to prevent any damage to the affected masonry.

1.15 PROJECT RECORD DOCUMENTS

A. Provide the record documents associated with the work of Division 23 in strict accordance with the provisions of these specifications.

B. Throughout progress of the Division 23 Work, maintain an accurate record of changes in the Contract Documents that apply to work of Division 23. Changes shall include all addendums issued during bidding. Maintain an accurate record of the location of mechanical service lines and outlets and all outside utilities.

C. Delegate the responsibility for maintenance of Record Documents to one person on the Contractor's staff as approved by the Architect/Engineer. Submit in writing at the pre-construction conference the name and credentials of the person responsible for record mark-ups and maintenance.

D. Accuracy of Records
   1. Thoroughly coordinate changes within the Record Documents, making adequate and proper entries on each page of Specifications and each sheet of drawings and other documents where such entry is required to show the change properly. Match the symbology and format of the base documents.
   2. Accuracy of records shall be such that a future verification of items shown in the Contract Documents may rely reasonably on information obtained from the approved Project Record Documents.

E. Maintain the job set of Record Documents completely protected from deterioration and from loss and damage until completion of the work and transfer of all recorded data to the final Project Record Documents.

F. Making Entries on Drawings

1. Using an erasable colored pencil (not ink or indelible pencil), clearly describe the change by graphic line and note as required.
2. Date all entries.
3. Call attention to the entry by a "cloud" drawn around the area or areas affected.
4. In the event of overlapping changes, use different colors for the overlapping changes.
5. Make entries within 24 hours after receipt of information that the change has occurred.
6. Maintain the base drawing format and use the same symbology.
7. Convert field mark-ups to finished CADD record drawings when required in this section.

G. Conversion of Schematic Layouts
1. In some cases on the drawings, arrangements of ductwork and piping and similar items are shown schematically and are not intended to portray precise physical layout. Determine final physical arrangement subject to the Architect/Engineer's approval. However, design of future modifications of the facility may require accurate information as to the final physical layout of items that are shown only schematically on the drawings.
2. Show on the job set of record drawings, by dimension accurate to within one inch, the centerline of each run of items such as all sleeves and piping, etc., below grade, in walls, or in the concrete slab. A surface mounted device indicates the exact location:
   a. Clearly identify the item by accurate note such as "Chilled Water" and the like.
   b. Show, by symbol or note, the vertical location of the item "under slab," "in ceiling plenum," "exposed," and the like.
   c. Make all identification sufficiently descriptive that it may be related reliably to the specifications.

H. Final Project Record Documents
1. The purpose of the final Project Record Documents is to provide factual
   a. information regarding all aspects of the Work, both concealed and visible, to enable future modification of the Work to proceed without lengthy and expensive site measurement, investigation, and examination.
2. Provide completed record drawings on CD and one Mylar film reproducible of each drawing.
3. Refer to Section 017839 for additional requirements.

1.16 OPERATION AND MAINTENANCE DATA

A. Well before substantial completion, submit two copies of a preliminary draft of the proposed manual(s) to the Architect/Engineer for review and comments. Allow a minimum of ten (10) working days for review.

B. Submit specified number copies of the approved manual to the Architect/Engineer prior to indoctrination of operation and maintenance personnel.

C. Prepare in accordance with the following standards:

Format:	
Size:	8½" x 11"
Paper:	White bond, at least 20 lb. weight

Text:	Neatly written or printed
Drawings:	11" in height preferable; bind in with text; foldouts acceptable; larger drawings are acceptable but fold to fit within the Manual and provide a drawing pocket inside rear cover or bind in with text.
Flysheets:	Separate each section of the Manual with neatly prepared flysheets briefly describing contents of the ensuing section; flysheets may be in color.
Binding:	Use heavy-duty plastic or fiberboard covers with binding mechanism concealed inside the manual; 3-ring binders will be acceptable; all binding is subject to the Architect/ Engineer's approval.
Measurements:	Provide all measurements in U.S. standard units such as feet-and-inches, lbs, and cfm. Where items may be expected to be measured within ten years in accordance with metric formulae, provide additional measurements in the "International System of Units" (SI).

D. Provide front and back covers for each manual, using durable material approved by the Architect/Engineer, and clearly identified on or through the cover with at least the following information:
   1. Name and Address of Work
   2. Name of Contractor
   3. General subject of this manual
   4. Space for approval signature of the Architect/Engineer and approval date

1.17 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Contents: Include at least the following:
   1. Neatly typewritten index near the front of the manual, giving immediate information as to location within the manual of all emergency information regarding the installation.
   2. Complete instructions regarding operation and maintenance of all equipment provided including lubrication, disassembly, and reassembly.
   3. Complete nomenclature of all parts of all equipment.
   4. Complete nomenclature and part number of all replaceable parts, name and address of nearest vendor, and all other data pertinent to procurement procedures.
   5. Copy of all guarantees and warranties issued.
   6. Manufacturer's bulletins, drawings, and descriptive data, clearly indicating the precise items included in this installation and deleting, or otherwise clearly indicating, all manufacturers' data with which this installation is not concerned.
   7. Such other data as required in other sections of these specifications.

1.18 EQUIPMENT FOUNDATIONS

A. Provide equipment foundations associated with the work in accordance with the provisions of these specifications

B. Provide concrete bases for all pad or floor mounted equipment. Bases shall be four inches (4") high above finished floors or grades (unless otherwise noted) and shall protrude two inches (2") beyond all sides of equipment and shall have exposed chamfer edges. Construct bases from ready-mixed hardrock concrete, ASTM C94, reinforced with #3 rebar, ASTM A615, Grade 40, at 18" on center each way.

C. Field verify exact location of outdoor pad mounted equipment with the Architect/Engineer. Supply necessary fill and grade site to provide natural drainage away from equipment.

1.19 PAINTING

A. All equipment shall be delivered to the job with suitable factory finish. Should the finish be damaged in transit or during the installation, it shall be finished to match appearance of original finish. All work shall be subject to approval by Architect/Engineer.

1.20 TESTING AND INSPECTION

A. Provide personnel and equipment, make required tests, and secure required approvals from the Architect/Engineer and governmental agencies having jurisdiction.

B. Make written notice to the Architect/Engineer, adequately in advance, of each of the following stages of construction:
   1. When all rough-in is complete, but not covered;
   2. As specified in all Division 23 sections.
   3. At the completion of the work of Division 23.

C. When material or workmanship is found to not comply with the specified requirements, remove the noncomplying items from the job site and replace them with items complying with the specified requirements at no additional cost to the Architect/Engineer/Owner. This shall be performed within 3 days after receipt of written notice of noncompliance.

1.21 WARRANTY

A. Warranty all equipment and workmanship for a period of one year after date of substantial completion and replace or repair any faulty equipment or installation at no cost to the Architect/Engineer/Owner for such service during this period, all in accordance with requirements of Division 01.

B. Provide full material warranty on all compressors for a period of five years after date of substantial completion.

C. This warranty shall not void specific warranties issued by manufacturers for greater periods of time. Nor shall it void any rights guaranteed to the Owner by law.

D. Warranties shall be in writing in a form satisfactory to the Owner, and shall be delivered to the Owner before final payment is made.

1.22 PROJECT COMPLETION

A. Upon completion of the work of Division 23, thoroughly clean all exposed portions of the mechanical installation, removing all traces of soil, labels, grease, oil, and other foreign material, and using only the type cleaner recommended by the manufacturer of the item being cleaned.

END OF SECTION

SECTION 23 0400
ARCHITECTURAL REQUIREMENTS FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Size, Weight, Fall Protection and Screening Requirements for HVAC Unit Field Modifications

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures, project meetings, progress schedules and documentation, reports, coordination.

B. Section 01 6000 - Product Requirements: Fundamental product requirements, substitutions and product options, delivery, storage, and handling.

C. Division 23 - Heating, Ventilating and Air Conditioning

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the installation of all HVAC equipment with size, weight, fall protection and screening requirements for HVAC Units.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Provide engineered drawings stating compliance with this specification section.

C. Provide sightline study to verify compliance with this specification section.

1.05 QUALITY ASSURANCE

A. Work covered by this section of the specifications shall conform to the contract documents, as well as state and local codes.

B. Designer Qualifications: Perform design under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in Texas.

C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

D. Installer Qualifications: Company specializing in performing work of the type specified and with minimum three years of documented experience.

E. Copies of Documents at Project Site: Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.06 ARCHITECTURAL REQUIREMENTS

A. The purpose of these specifications is to define the performance and design standards for modifications of HVAC equipment required for products not listed as "Basis of Design" or relocated due to other coordination parameters.

B. Coordinate the installation of all HVAC equipment with size, weight, fall protection and screening requirements for HVAC Units and make adustments as required to comply with state and local codes and ordinances.

C. Screening:
   1. Contractor shall verify that the unit heights and placement for the provided equipment and curbs do not exceed those detailed in the construction documents.

2. If the total height and placement differs from the locations or details of the construction documents, the Contractor shall perform a sightline study to verify compliance with the local screening codes and ordinances and make the required modifications to comply. Contractor shall verify compliance before any parapet walls are constructed or screening equipment is ordered.

D. Size:
   1. Contractor shall verify the size of all units, roof curbs and structural openings for equipment that deviate from the units or openings as detailed in the construction documents and make the required adjustments.

E. Weight:
   1. Contractor shall confirm the weights of the provided equipment and verify compliance with the designed loads shown on the construction documents. If the weights exceed those designed, Contractor shall coordinate with the General Contractor and Structural Detailer to adjust the joist or steel design as required.

F. Fall Protection:
   1. Contractor shall provide fall protection for any unit locations that are modified in the field, where the modifications locate them adjacent to any hazzards that require fall protection by state or local codes.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 23 0517
SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe sleeves.

B. Pipe-sleeve seals.

1.02 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.

1.03 REFERENCE STANDARDS

A. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2022a.

B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2023a.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified this section.
   1. Minimum three years experience.

C. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store sleeve and sleeve seals in shipping containers, with labeling in place.

B. Provide temporary protective coating on cast iron and steel sleeves if shipped loose.

PART 2 PRODUCTS

2.01 PIPE SLEEVES

A. Vertical Piping:
   1. Sleeve Length: 2 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.

B. Plastic or Sheet Metal: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.

C. Pipe Passing Through Below Grade Exterior Walls:
   1. Zinc coated or cast iron pipe.
   2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.

D. Pipe Passing Through Mechanical, Laundry, and Animal Room Floors above Basement:
   1. Galvanized steel pipe or black iron pipe with asphalt coating.
   2. Connect sleeve with floor plate except in mechanical rooms.

E. Clearances:
   1. Provide allowance for insulated piping.
   2. Wall, Floor, Partitions, and Beam Flanges: 1 inch greater than external pipe diameter.
   3. All Rated Openings: Caulked tight with fire stopping material in compliance with ASTM E814 in accordance with Section 07 8400 to prevent the spread of fire, smoke, and gases.

2.02 PIPE-SLEEVE SEALS

A. Modular Mechanical Sleeve-Seal:
   1. Elastomer-based interlocking links 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. Glass-reinforced plastic pressure end plates.

B. Sealing Compounds:
   1. Provide packing and sealing compound to fill pipe to sleeve thickness.
   2. Combined packing and seal compound is to match partition fire-resistance hourly rating.

C. Pipe Sleeve Material:
   1. Bearing Walls: Steel, cast iron, or terra-cotta pipe.
   2. Masonry Structures: Sheet metal or fiber.

D. Wall Sleeve: PVC material with waterstop collar, and nailer end-caps.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and foreign material, from inside and outside, before assembly.

3.02 INSTALLATION

A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

B. Install piping to conserve building space, to not interfere with use of space and other work.

C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

D. Inserts:
   1. Provide inserts for placement in concrete formwork.
   2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
   3. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
   4. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

E. Structural Considerations:
   1. Do not penetrate building structural members unless indicated.

F. Provide sleeves when penetrating footings, floors, walls, partitions, and roofs. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
   1. Underground Piping: Caulk pipe sleeve watertight with lead and oakum or mechanically expandable chloroprene inserts with bitumen sealed metal components.
   2. Aboveground Piping:

a. Pack solid using mineral fiber in compliance with ASTM C592.
b. Fill space with an elastomer caulk to a depth of 0.50 inch where penetrations occur between conditioned and unconditioned spaces.

3. All Rated Openings: Caulk tight with fire stopping material in compliance with ASTM E814 in accordance with Section 07 8400 to prevent the spread of fire, smoke, and gases.
4. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.

G. 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 water-tight seal.
6. Install in accordance with manufacturer's recommendations.

H. 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.

3.03 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 23 0519
METERS AND GAUGES FOR HVAC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pressure gauges and pressure gauge taps.

B. Thermometers and thermometer wells.

C. Static pressure gauges.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. ASME B40.100 - Pressure Gauges and Gauge Attachments; 2022.

B. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers; 2014 (Reapproved 2025).

C. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers; 2014 (Reapproved 2021).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide list that indicates use, operating range, total range and location for manufactured components.

C. Project Record Documents: Record actual locations of components and instrumentation.

1.05 FIELD CONDITIONS

A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

PART 2 PRODUCTS

2.01 PRESSURE GAUGES

A. Pressure Gauges: ASME B40.100, drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.
   1. Case: Steel with brass bourdon tube.
   2. Size: 4-1/2 inch diameter.
   3. Mid-Scale Accuracy: One percent.
   4. Scale: Psi.

2.02 PRESSURE GAUGE TAPPINGS

A. Gauge Cock: Tee or lever handle, brass for maximum 150 psi.

B. Needle Valve: Brass, 1/4 inch NPT for minimum 150 psi.

C. Pulsation Damper: Pressure snubber, brass with 1/4 inch connections.

2.03 STEM TYPE THERMOMETERS

A. Thermometers - Adjustable Angle: Red- or blue-appearing non-toxic liquid in glass; ASTM E1; lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device; adjustable 360 degrees in horizontal plane, 180 degrees in vertical plane.
   1. Size: 7 inch scale.
   2. Window: Clear glass.
   3. Stem: 3/4 inch NPT brass.

4. Accuracy: 2 percent, per ASTM E77.
5. Calibration: Degrees F.

2.04 THERMOMETER SUPPORTS

A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain.

2.05 TEST PLUGS

A. Test Plug: 1/4 inch or 1/2 inch brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with neoprene core for temperatures up to 200 degrees F.

2.06 STATIC PRESSURE GAUGES

A. 3-1/2 inch diameter dial in metal case, diaphragm actuated, black figures on white background, front recalibration adjustment, 2 percent of full scale accuracy.

B. Accessories: Static pressure tips with compression fittings for bulkhead mounting, 1/4 inch diameter tubing.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide one pressure gauge per pump, installing taps before strainers and on suction and discharge of pump. Pipe to gauge.

C. Install pressure gauges with pulsation dampers. Provide gauge cock to isolate each gauge. Extend nipples to allow clearance from insulation.

D. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inch for installation of thermometer sockets. Ensure sockets allow clearance from insulation.

E. Install thermometer sockets adjacent to controls system thermostat, transmitter, or sensor sockets. Refer to Section 23 0923.

F. Coil and conceal excess capillary on remote element instruments.

G. Provide instruments with scale ranges selected according to service with largest appropriate scale.

H. Install gauges and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

I. Adjust gauges and thermometers to final angle, clean windows and lenses, and calibrate to zero.

J. Locate test plugs adjacent thermometers and thermometer sockets.

END OF SECTION

SECTION 23 0523
GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Ball valves.
B. Butterfly valves.
C. Check valves.
D. Gate valves.
E. Chainwheels.

1.02 RELATED REQUIREMENTS

1.03 ABBREVIATIONS AND ACRONYMS

A. CWP: Cold working pressure.
B. EPDM: Ethylene propylene copolymer rubber.
C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
D. NRS: Nonrising stem.
E. OS&Y: Outside screw and yoke.
F. PTFE: Polytetrafluoroethylene.
G. RS: Rising stem.
H. TFE: Tetrafluoroethylene.
I. WOG: Water, oil, and gas.

1.04 REFERENCE STANDARDS

A. ASME B1.20.1 - Pipe Threads, General Purpose, Inch; 2013 (Reaffirmed 2018).
B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2026.
C. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24 Metric/Inch Standard; 2025.
D. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.
E. ASME B31.9 - Building Services Piping; 2025.
F. 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; 2025, with Errata.
G. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings; 2004 (Reapproved 2023).
H. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings; 2017 (Reapproved 2025).
I. MSS SP-45 - Drain and Bypass Connections; 2020.
J. MSS SP-67 - Butterfly Valves; 2022.
K. MSS SP-70 - Gray Iron Gate Valves, Flanged and Threaded Ends; 2011.
L. MSS SP-71 - Gray Iron Swing Check Valves, Flanged and Threaded Ends; 2018.
M. MSS SP-72 - Ball Valves with Flanged or Butt-Welding Ends for General Service; 2010a.
N. MSS SP-80 - Bronze Gate, Globe, Angle, and Check Valves; 2019.

O. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

C. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listings.

1.06 QUALITY ASSURANCE

A. Manufacturer:
   1. Obtain valves for each valve type from single manufacturer.

B. Welding Materials and Procedures: Comply with ASME BPVC-IX.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
   1. Minimize exposure of operable surfaces by setting plug and ball valves to open position.
   2. Protect valve parts exposed to piped medium against rust and corrosion.
   3. Protect valve piping connections such as grooves, weld ends, threads, and flange faces.
   4. Adjust globe, gate, and angle valves to the closed position to avoid clattering.
   5. Secure check valves in either the closed position or open position.
   6. Adjust butterfly valves to closed or partially closed position.

B. Use the following precautions during storage:
   1. Maintain valve end protection and protect flanges and specialties from dirt.
      a. Provide temporary inlet and outlet caps.
      b. Maintain caps in place until installation.
   2. Store valves in shipping containers and maintain in place until installation.
      a. Store valves indoors in dry environment.
      b. Store valves off the ground in watertight enclosures when indoor storage is not an option.

C. Exercise the following precautions for handling:
   1. Handle large valves with sling, modified to avoid damage to exposed parts.
   2. Avoid the use of operating handles or stems as rigging or lifting points.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Listed pipe sizes shown using nominal pipe sizes (NPS) and nominal diameter (DN).

B. Provide the following valves for the applications if not indicated on drawings:
   1. Throttling (Hydronic): Butterfly and Ball.
   2. Isolation (Shutoff): Butterfly, Gate, and Ball.
   3. Swing Check (Pump Outlet):
      a. Size 2 inch and Smaller: Bronze with bronze disc.
      b. Size 2-1/2 inch and Larger: Iron with center-guided with resilient seat.
   4. Dead-End: Butterfly, single-flange (lug) type.

C. Chilled, Condenser, and Heating Hot Water Valves:
   1. Size 2 inch and Smaller, Brass and Bronze Valves:

a. Threaded or solder-joint ends.
b. Ball: Full port, two piece, brass trim.
c. Gate: NRS, Class 125.

2. Size 2-1/2 inch and Larger, Iron Valves:
a. 2-1/2 inch to 4 inch: Threaded ends.
b. Ball: 2-1/2 NPS to 10 inch, Class 150.
c. Single-Flange Butterfly: 2-1/2 inch to 12 inch, aluminum-bronze disc, EPDM seat, 200 CWP.
d. Single-Flange Butterfly: 14 inch to 24 inch, aluminum-bronze disc, EPDM seat, 150 CWP.
e. Grooved-End Butterfly: 2-1/2 inch to 12 inch, 175 CWP.
f. Swing Check: Metal seats, Class 125.
g. Swing Check with Closure Control: 2-1/2 inch to 12 inch, lever and spring, Class 125.
h. Gate: NRS, Class 125.

2.02 GENERAL REQUIREMENTS

A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.

B. Valve Sizes: Match upstream piping unless otherwise indicated.

C. Valve Actuator Types:
1. Handwheel: Valves other than quarter-turn types.
2. Hand Lever: Quarter-turn valves 6 inch and smaller.
3. Chainwheel: Device for attachment to valve handwheel, stem, or other actuator, of size and with chain for mounting height, as indicated in the "Valve Installation" Article.

D. Valves in Insulated Piping: Provide 2 inch stem extensions and the following features:
1. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
2. Butterfly Valves: Extended neck.

E. Memory Stops: Fully adjustable after insulation is installed.

F. Valve-End Connections:
1. Threaded End Valves: ASME B1.20.1.
2. Flanges on Iron Valves: ASME B16.1 for flanges on iron valves.
3. Pipe Flanges and Flanged Fittings 1/2 inch through 24 inch: ASME B16.5.
4. Solder Joint Connections: ASME B16.18.

G. General ASME Compliance:
1. Building Services Piping Valves: ASME B31.9.

H. Bronze Valves:
1. Fabricate from dezincification resistant material.
2. Copper alloys containing more than 15 percent zinc are not permitted.

I. Valve Bypass and Drain Connections: MSS SP-45.

J. Source Limitations: Obtain each valve type from a single manufacturer.

2.03 BRONZE, BALL VALVES

A. General:
1. Fabricate from dezincification resistant material.
2. Copper alloys containing more than 15 percent zinc are not permitted.

B. Two Piece, Full Port with Bronze or Brass Trim:
   1. Comply with MSS SP-110.
   2. WSP Rating: 150 psi.
   3. WOG Rating: 400 psi.
   4. Body: Forged bronze or dezincified-brass alloy.
   5. End Connections: Pipe thread or solder.
   6. Seats: PTFE.
   7. Stem: Bronze or brass.
   8. Ball: Chrome plated brass.
   9. Operator: Provide lockable handle, memory stop, and stem extension.

2.04 IRON, BALL VALVES

A. Split Body, Full Port:
   1. Comply with MSS SP-72.
   2. CWP Rating: 200 psi.
   3. Body: ASTM A126, gray iron.
   4. Ends: Flanged.
   5. Seats: PTFE.
   6. Stem: Stainless steel.
   7. Ball: Stainless steel.

2.05 IRON, SINGLE FLANGE BUTTERFLY VALVES

A. Wafer Style:
   1. Comply with MSS SP-67, Type I.
   2. Wafer Style, CWP Ratings:
      a. Sizes 2 to 12 inch: 200 psi.
      b. Sizes 14 to 24 inch: 150 psi.
      c. Vacuum Service: Down to 29.9 in-Hg.
   3. Body Material: ASTM A126 cast iron.
   4. Stem: One or two-piece stainless steel.
   5. Seat: EPDM.
   6. Disc: Aluminum-bronze.
   7. Operator: Gear operator with handwheel over direct-mount actuator base.

2.06 BRONZE, SWING CHECK VALVES

A. Class 125:
   1. Pressure and Temperature Rating: MSS SP-80, Type 3.
   2. Design: Y-pattern, horizontal or vertical flow.
   3. WSP Rating: 200 psi.
   4. Body: Bronze, ASTM B62.
   5. End Connections: Threaded or soldered.
   6. Disc: Bronze.

B. Class 150:
   1. Pressure and Temperature Rating: MSS SP-80, Type 3.
   2. Design: Y-pattern, horizontal or vertical flow.
   3. CWP Rating: 300 psi.
   4. Body: Bronze, ASTM B62.
   5. End Connections: Threaded or soldered.
   6. Disc: Bronze.

2.07 IRON, SWING CHECK VALVES WITH CLOSURE CONTROL

A. Class 125:
   1. Comply with MSS SP-71, Type I.
   2. Body Design: Clear or full waterway.
   3. Body Material: ASTM A126, gray iron with bolted bonnet.
   4. Ends: Flanged.
   5. Trim: Bronze.
   6. Gasket: Asbestos free.
   7. Closer Control: Factory installed, exterior lever, and spring or weight.

2.08 BRONZE, GATE VALVES

A. Nonrising Stem or NRS:
   1. Pressure-Temperature Range: MSS SP-80, Type I.
   2. Class 125:
   3. Class 150: CWP Rating; 300 psi.
   4. Body: ASTM B62, bronze with integral seat and screw-in bonnet.
   5. Ends Connections: Threaded or solder.
   6. Stem: Bronze.
   7. Disc: Solid wedge; bronze.
   8. Packing: Asbestos free.
   9. Handwheel Operator: Malleable iron or bronze.

2.09 IRON, GATE VALVES

A. NRS or OS&Y:
   1. Comply with MSS SP-70, Type I.
   2. Body Material: Gray iron with bolted bonnet.
   3. Ends: Flanged.
   4. Trim: Bronze.
   5. Disc: Solid wedge.
   6. Packing and Gasket: Asbestos free.

2.10 CHAINWHEELS

A. Description: Valve actuation assembly with sprocket rim, brackets, and chain.
   1. Brackets: Type, number, size, and fasteners required to mount actuator on valve.
   2. Attachment: For connection to ball, butterfly, and plug valve stems.
   3. Sprocket Rim with Chain Guides: Ductile iron include zinc coating.
   4. Chain: Hot-dip galvanized steel. Sized to fit sprocket rim.

PART 3 EXECUTION

3.01 EXAMINATION

A. Discard all packing materials and verify that valve interior, including threads and flanges, are completely clean without signs of damage or degradation that could result in leakage.

B. Verify valve parts to be fully operational in all positions from closed to fully open.

C. Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.

D. Should valve is determined to be defective, replace with new valve.

3.02 INSTALLATION

A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.

B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.

C. Where valve support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welds.

D. Install check valves where necessary to maintain direction of flow as follows:
   1. Swing Check: Install horizontal maintaining hinge pin level.

E. Provide chainwheels on operators for valves 4 NPS and larger where located 96 NPS or more above finished floor, terminating 60 NPS above finished floor.

END OF SECTION

SECTION 23 0529
HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Support and attachment components.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete equipment pads.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

B. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.

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; 2025.

D. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2024.

E. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2022).

F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.

G. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.

I. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.

J. FM (AG) - FM Approval Guide; Current Edition.

K. MFMA-4 - Metal Framing Standards Publication; 2004.

L. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2025.

M. UL (DIR) - Online Certifications Directory; Current Edition.

N. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 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 3000.

1.05 SUBMITTALS

A. See Section 01 3000 - 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 thermal insulated pipe supports.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 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. 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. 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 zinc-plated steel or galvanized steel.
b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
3. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch.
4. Minimum Channel Dimensions: 1-5/8 inch width by 13/16 inch height.
5. 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. Thermal Insulated Pipe Supports:
   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. Pipe supports to be provided for nominally sized, 1/2 to 30 inch iron pipes.
      d. Insulation inserts to consist of rigid polyisocyanurate (urethane) insulation surrounded by a 360 degree, PVC jacketing.
   2. PVC Jacket:
      a. Pipe insulation protection shields to be provided with a ball bearing hinge and locking seam.
      b. Moisture Vapor Transmission: 0.0071 perm inch, when tested in accordance with ASTM E96/E96M.
      c. Thickness: 60 mil.
   3. Pipe insulation protection shields to be provided at the hanger points and guide locations on pipes requiring insulation as indicated on drawings.

G. 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.
      b. Roller Support: MSS SP-58 Types 41 or 43 through 46, with appropriate saddle of MSS SP-58 Type 39 for insulated pipe.

H. 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, ductile iron with stainless steel and zinc finish.

3. Small or Junior Beam Clamp: MSS SP-58 type 19, ductile iron with zinc finish. For inverted usage provide manufacturer listed size(s).
4. Wide Mouth Beam Clamp: MSS SP-58 type 19, ductile iron with zinc finish.
5. Centerload Beam Clamp with Extension Piece: MSS SP-58 type 30, ductile iron with zinc finish.
6. FM (AG) and UL (DIR) Approved Beam Clamp: MSS SP-58 type 19, plated finish,
7. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.

I. 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, 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, 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.

J. U-Bolts:
1. MSS SP-58 Type 24, carbon steel u-bolt for pipe support or anchoring.

K. Strut Clamps:
1. Pipe Clamp: Two-piece rigid, universal, or outer diameter type, carbon steel with epoxy copper or zinc finish.

L. Insulation Clamps:
1. Two bolt-type clamps designed for installation under insulation.
2. Material: Carbon steel with epoxy copper or zinc finish.

M. Pipe Hangers:
1. Clevis Hangers, Adjustable:
   a. Light-Duty: MSS SP-58 Type 1, zinc-plated.
   b. Standard-Duty: MSS SP-58 Type 1, zinc-plated.

N. 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.

O. 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.

P. 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.

Q. Nonpenetrating Rooftop Supports for Low-Slope Roofs:
1. Provide steel pedestals with thermoplastic or rubber base that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified.

2. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
3. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
4. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.

R. 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.

S. Anchors and Fasteners:
1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
4. Hollow Masonry: Use toggle bolts.
5. Hollow Stud Walls: Use toggle bolts.
6. Steel: Use beam-ceiling clamps, beam clamps, machine bolts, or welded threaded studs.
7. Beam Ceiling Flanges: ASTM A47/A47M Grade 32510, malleable iron or stainless steel with copper, stainless steel, or zinc finish.
8. Sheet Metal: Use sheet metal screws.
9. Wood: Use wood screws.
10. Plastic and lead anchors are not permitted.
11. Powder-actuated fasteners are not permitted.
12. Hammer-driven anchors and fasteners are not permitted.
13. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
   a. Comply with MFMA-4.
   b. Channel Material: Use galvanized steel.
   c. Manufacturer: Same as manufacturer of metal channel (strut) framing system.
14. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

PART 3 EXECUTION

3.01 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.

3.02 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. Preset Concrete Inserts: Use manufacturer-provided closure strips to inhibit concrete seepage during concrete pour.

J. Secure fasteners according to manufacturer's recommended torque settings.

K. Remove temporary supports.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - 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 23 0533
HEAT TRACING FOR HVAC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Self-regulating parallel resistance electric heating cable.

1.02 RELATED REQUIREMENTS

A. Section 23 0553 - Identification for HVAC Piping and Equipment.

B. Section 26 0526 - Grounding and Bonding for Electrical Systems.

1.03 REFERENCE STANDARDS

A. IEEE 515.1 - IEEE Standard for the Testing, Design, Installation, and Maintenance of Electrical Resistance Trace Heating for Commercial Applications; 2022.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for electric heat tracing and _____.

C. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions of equipment and controls, maintenance and repair data, and parts listings.

1.05 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide two year manufacturer warranty for cables, connection kits, accessories, and controls.

PART 2 PRODUCTS

2.01 SELF-REGULATING PARALLEL RESISTANCE ELECTRIC HEATING CABLE

A. Provide products listed, classified, and labeled by UL (DIR), ITS (DIR), or testing firm acceptable to authorities having jurisdiction (AHJ).

B. Factory Rating and Testing: Comply with IEEE 515.1.

C. Heating Element:
   1. Provide pair of parallel No. 16 tinned or nickel coated stranded copper bus wires embedded in cross linked conductive polymer core with varying heat output in response to temperature along its length.
   2. Terminations: Waterproof, factory assembled, non-heating leads with connector at one end and water-tight seal at opposite end.
   3. Capable of crossing over itself without overheating.

D. Insulated Jacket: Flame retardant polyolefin.

E. Cable Cover: Provide tinned copper and polyolefin outer jacket with UV inhibitor.

F. Maximum Power-On Operating Temperature: 150 degrees F.

G. Maximum Power-Off Exposure Temperature: 185 degrees F.

H. Electrical Characteristics:
   1. 5 W/lineal ft.
   2. 120 volts or 277 volts, single phase, 60 Hz.

2.02 OUTER JACKET MARKINGS

A. Name of manufacturer, trademark, or other recognized symbol of identification.

B. Catalog number, reference number, or model.

C. Month and year of manufacture, date coding, applicable serial number, or equivalent.

D. Agency listing or approval.

2.03 CONNECTION KITS

A. Provide power connection, splice/tee, and end seal kits compatible with the heating cable and without requiring cutting of the cable core to expose bus wires.

B. Furnish with NEMA 4X rating for prevention of corrosion and water ingress.

2.04 ACCESSORIES

A. Provide Accessories As Indicated or As Required for Complete Installation, Including but Not Limited To:
   1. High temperature, glass filament tape for attachment of heating cable to metal piping.
   2. Heat-conductive putty.
   3. Cable ties.
   4. Silicone end seals and splice kits.
   5. Installation clips.
   6. Warning labels for attachment to exterior of piping insulation. Refer to Section 23 0553.

2.05 CONTROLS

A. Pipe Mounted Thermostats:
   1. Remote bulb on capillary, resistance temperature device (RTD) or thermistor for direct sensing of pipe wall temperature.
   2. Control Enclosure: Corrosion resistant and waterproof.
   3. Provide a single set of dry contacts for general fault alarm condition.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping and equipment are ready to receive work.

B. Verify field measurements are as indicated on shop drawings.

C. Verify required power is available, in proper location, and ready for use.

3.02 PREPARATION

A. Clean all surfaces prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer.

3.03 INSTALLATION

A. Install in accordance with manufacturer's recommendations.

B. Comply with installation requirements of IEEE 515.1 and NFPA 70, Article 427.

C. Apply heating cable linearly on pipe with fiberglass tape only after piping has successfully completed any required pressure testing.

D. Comply with all national and local code requirements.

E. Grounding: Refer to Section 26 0526.

F. Identification:
   1. After thermal insulation installation, apply external pipeline decals to indicate presence of the thermal insulation cladding at intervals not to exceed 20 ft including cladding over each valve or other equipment that may require maintenance.

3.04 FIELD QUALITY CONTROL

A. Field Testing and Inspections:
   1. Commission system in accordance with installation and operation manual.
   2. Inspect for sources of water entry and proper sealing.
   3. Inspect weather barrier to confirm that no sharp edges are contacting the trace heating.
   4. Minimum Acceptable Insulation Resistance: 20 megohms or greater at a test voltage of 2500 VDC for polymer insulated trace heaters.
   5. Test heating cable integrity with megohmmeter at the following intervals:
      a. Before installing the cable.
      b. After cable has been installed onto the piping.
      c. After installing the connection kits.
      d. After the installation of thermal insulation onto the piping.
      e. Prior to initial start-up (commissioning).
   6. Measure voltage and current at each unit.
   7. Controls:
      a. Verify control parameters are set to the application requirements.
      b. Verify factory provided digital temperature controller is correctly configured with the building automation system.

3.05 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 23 0548
VIBRATION AND SEISMIC CONTROLS FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Vibration isolation requirements.

B. Vibration-isolated equipment support bases.

C. Vibration isolators.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

A. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate selection and arrangement of vibration isolation and/or seismic control components with the actual equipment 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. 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 3000.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.
   1. Vibration Isolators: Include rated load capacities and deflections; include information on color coding or other identification methods for spring element load capacities.

C. Shop Drawings - Vibration Isolation Systems:
   1. Include dimensioned plan views and sections indicating proposed arrangement of vibration isolators; indicate equipment weights and static deflections.
   2. Vibration-Isolated Equipment Support Bases: Include base weights, including concrete fill where applicable; indicate equipment mounting provisions.

1.06 QUALITY ASSURANCE

A. Comply with applicable building code.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 VIBRATION ISOLATION REQUIREMENTS

A. Design and provide vibration isolation systems to reduce vibration transmission to supporting structure from vibration-producing HVAC equipment and/or HVAC connections to vibration-isolated equipment.

B. Comply with applicable general recommendations of ASHRAE (HVACA), where not in conflict with other specified requirements:

C. General Requirements:
   1. Select vibration isolators to provide required static deflection.
   2. Select vibration isolators for uniform deflection based on distributed operating weight of actual installed equipment.
   3. Select vibration-isolated equipment support bases and associated vibration isolators to provide minimum 2-inch operating clearance beneath base unless otherwise indicated.

D. Piping Isolation:
   1. Provide vibration isolators for piping supports:
      a. Located in equipment rooms.
      b. Located within 50 feet of connected vibration-isolated equipment and pressure-regulating valve (PRV) stations.
   2. Minimum Static Deflection:
      a. First Three Supports Closest to Isolated Equipment: Same as static deflection of equipment; maximum of 2 inch deflection required.
      b. Remainder of Supports: 0.75 inch deflection unless otherwise indicated.
   3. Suspended Piping, Nonseismic Applications: Use resilient material isolator hangers, spring isolator hangers, or combination resilient material/spring isolator hangers.
   4. Floor-Mounted Piping, Nonseismic Applications: Use open (unhoused) spring isolators.
   5. Use modular seal where vibration-isolated piping penetrates building elements (e.g., walls, floors) arranged to prevent vibration transmission to structure.

E. Thrust Restraint Applications:
   1. Use thrust restraints to resist horizontal motion due to thrust for fan heads, suspended fans, and base-mounted and suspended air handling equipment operating at 2.0 inches wg or greater total static pressure.
   2. Minimum Static Deflection: Same as static deflection of equipment.
   3. Limit lateral movement to 0.25 inch or less unless otherwise indicated.

2.02 VIBRATION-ISOLATED EQUIPMENT SUPPORT BASES

A. Vibration-Isolated Structural Steel Bases:
   1. Description: Engineered structural steel frames with integral mounting provisions for vibration isolators, sized and configured for mounting of equipment.
   2. Centrifugal Fan Applications: Provide adjustable motor slide rails as required.

B. Vibration-Isolated Concrete Inertia Bases:
   1. Description: Concrete-filled engineered steel forms with integral mounting provisions for vibration isolators, sized and configured for mounting of equipment.
   2. Minimum Base Depth: 6 inches.
   3. Minimum Base Mass (Including Concrete): 1.5 times weight of supported equipment.
   4. Concrete Reinforcement: Welded or tied reinforcing bars running both ways in a single layer.
   5. Concrete: Filled on site with minimum 3000 psi concrete in accordance with Section 03 3000.
   6. Centrifugal Fan Applications: Provide adjustable motor slide rails as required.

7. Pump Applications: Size and configure bases for piping elbow supports as required.

2.03 VIBRATION ISOLATORS

A. General Requirements:
   1. Resilient Materials for Vibration Isolators: Oil, ozone, and oxidant resistant.
   2. Spring Elements for Spring Isolators:
      a. Color code or otherwise identify springs to indicate load capacity.
      b. Lateral Stability: Minimum lateral stiffness to vertical stiffness ratio of 0.8.
      c. Designed to operate in the linear portion of their load versus deflection curve over deflection range of not less than 50 percent above specified deflection.
      d. Designed to provide additional travel to solid of not less than 50 percent of rated deflection at rated load.
      e. Selected to provide designed deflection of not less than 75 percent of specified deflection.
      f. Selected to function without undue stress or overloading.

B. Vibration Isolators for Nonseismic Applications:
   1. Resilient Material Isolator Pads:
      a. Description: Single or multiple layer pads utilizing elastomeric (e.g., neoprene, rubber) or fiberglass isolator material.
      b. Pad Thickness: As required for specified minimum static deflection; minimum 0.25 inch thickness.
      c. Multiple Layer Pads: Provide bonded, galvanized sheet metal separation plate between each layer.
   2. Open (Unhoused) Spring Isolators:
      a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) without a housing.
      b. Bottom Load Plate: Nonskid, molded, elastomeric isolator material or steel with nonskid elastomeric isolator pad with provisions for bolting to supporting structure as required.
      c. Furnished with integral leveling device for positioning and securing supported equipment.
   3. Resilient Material Isolator Hangers, Nonseismic:
      a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing elastomeric (e.g., neoprene, rubber) or fiberglass isolator material for the lower hanger rod connection.
   4. Spring Isolator Hangers, Nonseismic:
      a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) in series with an elastomeric element for the lower hanger rod connection.
      b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.
   5. Combination Resilient Material/Spring Isolator Hangers, Nonseismic:
      a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) for the lower hanger rod connection and elastomeric (e.g., neoprene, rubber) or fiberglass isolator material for the upper hanger rod connection.
      b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.
   6. Thrust Restraints:

a. Description: Assembly utilizing free-standing, laterally stable steel spring designed for resisting horizontal motion due to thrust (e.g., air pressure from a fan), and intended for installation in pairs.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 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. Secure fasteners according to manufacturer's recommended torque settings.

D. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

E. Vibration Isolation Systems:
   1. Vibration-Isolated Equipment Support Bases:
      a. Provide specified minimum clearance beneath base.
   2. Spring Isolators:
      a. Position equipment at operating height; provide temporary blocking as required.
      b. Lift equipment free of isolators prior to lateral repositioning to avoid damage to isolators.
      c. Level equipment by adjusting isolators gradually in sequence to raise equipment uniformly such that excessive weight or stress is not placed on any single isolator.
   3. Isolator Hangers:
      a. Use precompressed isolator hangers where required to facilitate installation and prevent damage to equipment utility connection provisions.
      b. Locate isolator hangers at top of hanger rods in accordance with manufacturer's instructions.
   4. Thrust Restraints:
      a. Adjust restraint movement under normal operating static pressure.
   5. Clean debris from beneath vibration-isolated equipment that could cause short-circuiting of isolation.
   6. Use elastomeric grommets for attachments where required to prevent short-circuiting of isolation.
   7. Adjust isolators to be free of isolation short circuits during normal operation.
   8. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect vibration isolation and/or seismic control components for damage and defects.

C. Vibration Isolation Systems:
   1. Verify isolator static deflections.
   2. Verify required clearance beneath vibration-isolated equipment support bases.

3. Verify vibration isolation performance during normal operation; investigate sources of isolation short circuits.

D. Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control components.

END OF SECTION

SECTION 23 0553
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Adhesive-backed duct markers.

D. Ceiling tacks.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS

A. See Section 01 3000 - 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. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

E. Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

A. Equipment: Nameplates.

B. Air Terminal Units: Tags.

C. Control Panels: Nameplates.

D. Ductwork: Adhesive-backed duct markers.

E. Valves: Tags and ceiling tacks where located above lay-in ceiling.

2.02 NAMEPLATES

A. Description: Engraved piece with up to three lines of text.
   1. Letter Color: White.
   2. Letter Height: 1/4 inch.
   3. Background Color: Black.
   4. Nameplate Material:
      a. Plastic: Plastic with adhesive backing.
      b. Metal: Brass with center-side holes for screw fastening.

2.03 TAGS

A. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges and corrosion-resistant ball ch.

B. Valve Tag Chart: Typewritten 12-point letter size list in anodized aluminum frame.

2.04 ADHESIVE-BACKED DUCT MARKERS

A. Material: High gloss acrylic adhesive-backed vinyl film 0.0032 inch; printed with UV and chemical resistant inks.

B. Label Content: Include identification of duct service using same designations or abbreviations used on Drawings, and arrow indicating flow direction.

1. Flow Direction Arrows: Integral with duct system service lettering to accommodate both directions, or as a separate unit on each duct label to indicate flow direction.
2. Lettering Size: 1-1/2 inch minimum.

C. Style: Individual Label.

D. Color: Green/White.

2.05 CEILING TACKS

A. Description: Steel with 3/4 inch diameter color coded head.

B. Color code as follows:
1. HVAC Equipment: Yellow.
2. Fire Dampers and Smoke Dampers: Red.
3. Heating/Cooling Valves: Blue.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 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. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

E. Install ductwork with adhesive-backed duct markers. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.

F. 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 23 0593
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Commissioning activities.

1.02 RELATED REQUIREMENTS

A. 01 45 33 - Code-Required Quality Control

1.03 REFERENCE STANDARDS

A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition; 2016.

B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2024, with Errata (2025).

1.04 SUBMITTALS

A. See Section 01 3000 - 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, Construction Manager, and HVAC controls contractor.
   2. Submit six weeks prior to starting the testing, adjusting, and balancing work.
   3. Include certification that the plan developer has reviewed Contract Documents, the equipment and systems, and the control system with the Architect and other installers to sufficiently understand the design intent for each system.
   4. 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. Identification and types of measurement instruments to be used and their most recent calibration date.
      d. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
      e. Final test report forms to be used.
      f. Detailed step-by-step procedures for TAB work for each system and issue, including:
         1) Terminal flow calibration (for each terminal type).
         2) Diffuser proportioning.
         3) Branch/submain proportioning.
         4) Total flow calculations.
         5) Rechecking.
         6) Diversity issues.
      g. Details of how TOTAL flow will be determined; for example:
         1) Air: Sum of terminal flows via control system calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations.
         2) Water: Pump curves, circuit setter, flow station, ultrasonic, etc.

h. Procedures for field technician logs of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests (scope and frequency).
i. Procedures for formal deficiency reports, including scope, frequency and distribution.

C. Field Logs: Submit at least once a week to the Commissioning Authority and Construction Manager.

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. Submit to the the Commissioning Authority, Construction Manager, and HVAC controls contractor within two weeks after completion of testing, adjusting, and balancing.
2. Revise TAB plan to reflect actual procedures and submit as part of final report.
3. 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.
4. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
5. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
6. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
7. Units of Measure: Report data in I-P (inch-pound) units only.
8. Include the following on the title page of each report:
a. Name of Testing, Adjusting, and Balancing Agency.
b. Address of Testing, Adjusting, and Balancing Agency.
c. Telephone number of Testing, Adjusting, and Balancing Agency.
d. Project name.
e. Project location.
f. Project Architect.
g. Project Engineer.
h. Project Contractor.
i. Report date.

F. Project Record Documents: Record actual locations of flow measuring stations and balancing valves and rough setting.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:
1. AABC (NSTSB), AABC National Standards for Total System Balance.
2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.

D. TAB Agency Qualifications:
   1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
   2. Having minimum of three years documented experience.
   3. Certified by one of the following:
      a. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.
      b. NEBB, National Environmental Balancing Bureau: www.nebb.org/#sle.

E. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.02 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
   1. Systems are started and operating in a safe and normal condition.
   2. Temperature control systems are installed complete and operable.
   3. Proper thermal overload protection is in place for electrical equipment.
   4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
   5. Duct systems are clean of debris.
   6. Fans are rotating correctly.
   7. Fire and volume dampers are in place and open.
   8. Air coil fins are cleaned and combed.
   9. Access doors are closed and duct end caps are in place.
   10. Air outlets are installed and connected.
   11. Duct system leakage is minimized.
   12. Hydronic systems are flushed, filled, and vented.
   13. Pumps are rotating correctly.
   14. Proper strainer baskets are clean and in place.
   15. Service and balance valves are open.

B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

C. Beginning of work means acceptance of existing conditions.

3.03 PREPARATION

A. Hold a pre-balancing meeting at least one week prior to starting TAB work.
   1. Require attendance by all installers whose work will be tested, adjusted, or balanced.

B. Provide additional balancing devices as required.

3.04 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.05 RECORDING AND ADJUSTING

A. Field Logs: Maintain written logs including:

1. Running log of events and issues.
2. Discrepancies, deficient or uncompleted work by others.
3. Contract interpretation requests.
4. Lists of completed tests.

B. Ensure recorded data represents actual measured or observed conditions.

C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

D. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

E. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

F. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

3.06 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities.

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. 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.

N. On fan powered VAV boxes, adjust air flow switches for proper operation.

3.07 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.

3.08 COMMISSIONING

A. See Sections 01 45 33 - Code-Required Quality Control 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 a random sample equivalent to 10 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.

3.09 SCOPE

A. Test, adjust, and balance the following:
   1. HVAC Pumps.
   2. Packaged Steel Water Tube Boilers.
   3. Forced Air Furnaces.
   4. Air Cooled Water Chillers.
   5. Packaged Roof Top Heating/Cooling Units.
   6. Computer Room Air Conditioning Units.
   7. Air Handling Units.
   8. Fans.
   9. Air Terminal Units.
   10. Air Inlets and Outlets.

3.10 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. Sheave Make/Size/Bore.

B. 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. Total operating head pressure.
   9. Shut off, discharge and suction pressures.

C. Combustion Equipment:
   1. Boiler manufacturer.
   2. Model number.
   3. Serial number.
   4. Firing rate.

5. Overfire draft.
6. Gas pressure at meter outlet.
7. Gas flow rate.
8. Heat input.
9. Heat output.

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 Coils:
1. Identification/number.
2. Location.
3. Service.
4. Air flow, design and actual.
5. Entering air DB temperature, design and actual.
6. Entering air WB temperature, design and actual.
7. Leaving air DB temperature, design and actual.
8. Leaving air WB temperature, design and actual.
9. Water flow, design and actual.
10. Water pressure drop, design and actual.
11. Entering water temperature, design and actual.
12. Leaving water temperature, design and actual.
13. Air pressure drop, design and actual.

F. Heating Coils:
1. Identification/number.
2. Location.
3. Service.
4. Air flow, design and actual.
5. Water flow, design and actual.
6. Water pressure drop, design and actual.
7. Entering water temperature, design and actual.
8. Leaving water temperature, design and actual.
9. Entering air temperature, design and actual.
10. Leaving air temperature, design and actual.
11. Air pressure drop, design and actual.

G. Air Moving Equipment:
1. Location.
2. Manufacturer.
3. Model number.
4. Serial number.

5. Arrangement/Class/Discharge.
6. Air flow, specified and actual.
7. Return air flow, specified and actual.
8. Outside air flow, specified and actual.
9. Total static pressure (total external), specified and actual.
10. Sheave Make/Size/Bore.
11. Number of Belts/Make/Size.
12. Fan RPM.

H. Exhaust Fans:
1. Location.
2. Manufacturer.
3. Model number.
4. Serial number.
5. Air flow, specified and actual.
6. Total static pressure (total external), specified and actual.
7. Sheave Make/Size/Bore.
8. Number of Belts/Make/Size.
9. Fan RPM.

I. 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.

J. Terminal Unit Data:
1. Manufacturer.
2. Type, constant, variable, single, dual duct.
3. Identification/number.
4. Location.
5. Model number.
6. Size.
7. Minimum static pressure.
8. Minimum design air flow.
9. Maximum design air flow.
10. Maximum actual air flow.
11. Inlet static pressure.

K. Air Distribution Tests:
1. Air terminal number.
2. Room number/location.
3. Terminal type.
4. Terminal size.
5. Design air flow.
6. Test (final) air flow.
7. Percent of design air flow.

END OF SECTION

SECTION 23 0713
DUCT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Duct insulation.

B. Duct liner.

C. Jacketing and accessories.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

B. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

C. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2024.

D. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2025.

E. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings; 2025.

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 E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.

I. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.

J. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).

K. SAE AMS3779 - Tape, Adhesive, Pressure-Sensitive Thermal Radiation Resistant, Aluminum Coated Glass Cloth; 2016b.

L. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

M. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.

1.06 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.

1.07 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

2.01 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.

2.02 GLASS FIBER, FLEXIBLE

A. Manufacturer:

B. Insulation: ASTM C553; flexible, noncombustible blanket.
   1. K value: 0.27 at 75 degrees F, when tested in accordance with ASTM C518.

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. Vapor Barrier Mastic:
   1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

2.03 GLASS FIBER, RIGID

A. Insulation: ASTM C612; rigid, noncombustible blanket.
   1. K Value: 0.24 at 75 degrees F, when tested in accordance with ASTM C518.
   2. Maximum Density: 2.0 pcf.

B. 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.

C. Vapor Barrier Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure-sensitive rubber-based adhesive.

D. Indoor Vapor Barrier Finish:
   1. Cloth: Untreated; 9 oz/sq yd weight, glass fabric.
   2. Vinyl emulsion type acrylic, compatible with insulation, white color.

2.04 FIRE-RATED INSULATION SYSTEMS

A. Fire-Rated Board. Structural-grade, press-molded, xonolite calcium silicate, fireproofing board suitable for operating temperatures up to 1,700 deg. F. Comply with ASTM C 656, Type II, Grade 6. Tested and certified to provide 2-hour fire rating by an NRTL acceptable to authorities having jurisdiction.

B. Fire-Rated Blanket. High-temperature, flexible, blanket insulation with FSK jacket that is tested and certified to provide a 2-hour fire rating by an NRTL acceptable to authorities having jurisdiction.

2.05 JACKETING AND ACCESSORIES

A. 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. Finish: Smooth.
   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.

B. 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.

C. 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: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
   4. Finish: Match insulation.

2.06 DUCT LINER

A. Glass Fiber Insulation: Non-corrosive, incombustible glass fiber complying with ASTM C1071; flexible blanket, rigid board, and preformed round liner board; 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. Service Temperature: Up to 250 degrees F.
   4. Rated Velocity on Coated Air Side for Air Erosion: 5,000 fpm, minimum.

PART 3 EXECUTION

3.01 EXAMINATION

A. Test ductwork for design pressure prior to applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Insulated Ducts Conveying Air Below Ambient Temperature:
   1. Provide insulation with vapor barrier jackets.
   2. Continue insulation through walls, sleeves, hangers, and other duct penetrations.

D. Ducts Exposed in Mechanical Equipment Rooms or Finished Spaces (below 10 feet above finished floor): Finish with aluminum jacket.

E. Exterior Applications: Provide insulation with vapor barrier jacket. Cover with outdoor jacket finished as specified in Section 2.05 Jackets.

F. Slope exterior ductwork to shed water.

G. External Duct Insulation Application:
   1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
   2. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
   3. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
   4. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

H. 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. Duct dimensions indicated are net inside dimensions required for airflow. Increase duct size to allow for insulation thickness.

3.03 SCHEDULES

A. Exhaust Ducts Within 10 ft of Exterior Openings:
   1. Type: Mineral Fiber Blanket
   2. Thickness: 2 inch or as required to meet installed R-value of 6.0

B. Supply, Return and Outside Air Ducts:
   1. Type: Mineral Fiber Blanket (Concealed)
   2. Thickness: 2 inch or as required to meet installed R-value of 6.0

C. Ducts Exposed to Outdoors:
   1. Type: Mineral Fiber Board with field applied jacket
   2. Thickness: 3 inch or as required to meet installed R-value of 8.0

D. Type I, Commercial, Kitchen Hood Exhaust Duct and Plenum:
   1. Type: Fire-rated blanket or board
   2. Thickness: As required to achieve 2-hour fire rating

E. Duct Liner:
   1. Location: All exposed ductwork and first 15' at equipment connection.
   2. Type: Glass Fiber Insulation
   3. Thickness: 1 1/2" or as required to meet installed R-value of 6.0

END OF SECTION

SECTION 23 0719
HVAC PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping insulation.

B. Flexible removable and reusable blanket insulation.

C. Weather barrier coatings.

D. Jacketing and accessories.

E. Engineered wall outlet seals and refrigerant piping insulation protection.

1.02 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.

1.03 REFERENCE STANDARDS

A. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus; 2026.

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 2024).

E. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2026.

F. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2025.

G. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2023).

H. ASTM D610 - Standard Practice for Evaluating Degree of Rusting on Painted Steel Surfaces; 2025.

I. 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).

J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.

K. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.

L. 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).

M. 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).

N. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.

O. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).

P. ASTM G153 - Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials; 2013 (Reapproved 2021).

Q. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum three years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.07 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.01 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.

2.02 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. Insulation: ASTM C547 and ASTM C795; semi-rigid, noncombustible, end grain adhered to jacket.
   1. Maximum Service Temperature: 650 degrees F.
   2. 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-inches.

D. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

E. Vapor Barrier Lap Adhesive: Compatible with insulation.

F. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

G. Outdoor Vapor Barrier Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

2.03 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: 180 degrees F.
3. Connection: Waterproof vapor barrier adhesive.

B. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

C. Weather Barrier Coating: Air dried, contact adhesive, compatible with insulation and ASTM E84 compliant.

2.04 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.

2.05 JACKETING AND ACCESSORIES

A. PVC Plastic.
1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
a. Minimum Service Temperature: 0 degrees F.
b. Maximum Service Temperature: 150 degrees F.
c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
d. Thickness: 10 mil, 0.010 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. Finish: Embossed.
5. Joining: Longitudinal slip joints and 2 inch laps.
6. Fittings: 0.016 inch thick die-shaped fitting covers with factory-attached protective liner.
7. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

2.06 ENGINEERED WALL OUTLET SEALS AND REFRIGERANT PIPING INSULATION PROTECTION

A. Basis of Design: Airex Manufacturing, Inc.
1. Pipe Penetration Wall Seal: Airex Titan Outlet.
2. Refrigeration Pipe Insulation Protection System: Airex E-Flex Guard.

B. Pipe Penetration Wall Seal: Seals HVAC piping wall penetrations with compression gasket wall mounted rigid plastic outlet cover.
1. Outlet Cover Color: As selected by Architect.
2. Water Penetration: Comply with ASTM E331.
3. Air Leakage: Comply with ASTM E283.
4. Air Permeance: Comply with ASTM E2178.

C. Insulation Protection System: Refrigerant piping insulation PVC protective cover.
1. PVC Insulation Cover Color: Black with full-length velcro fastener.
2. Weatherization and Ultraviolet Exposure Protection: Comply with ASTM G153.

3. Water/Vapor Permeability: Comply with ASTM E96/E96M.
4. Anti-Fungal and Anti-Microbial Resistance: Comply with ASTM G21.
5. Flame Spread and Smoke Development Rating of 24/450: Comply with ASTM E84 or UL 723.

2.07 ACCESSORIES

A. General Requirements:
   1. Furnish compatible materials which do not contribute to corrosion, soften, or otherwise attack surfaces to which applied, in either the wet or dry state.
   2. Comply with ASTM C795 requirements for materials to be used on stainless steel surfaces.
   3. 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

3.01 EXAMINATION

A. Test piping for design pressure, liquid tightness, and continuity prior to applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Exposed Piping: Locate insulation and cover seams in least visible locations.

D. Insulated Pipes Conveying Fluids Below Ambient Temperature:
   1. Insulate entire system, including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

E. Glass Fiber Insulated Pipes Conveying Fluids Below Ambient Temperature:
   1. Provide vapor barrier jackets, factory-applied or field-applied; secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
   2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

F. 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.

G. 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.
   5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

H. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 07 8400.

I. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with PVC jacket and fitting covers.

J. 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.

K. Buried Piping: Provide factory-fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with 1 mil, 0.001 inch thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with polyester film.

L. 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.

3.03 SCHEDULE

A. Heating Systems:
   1. Heating Water Supply and Return:
      a. Indoor Applications:
         1) NPS 1-1/2 inch and smaller: Preformed glass fiber, 1-1/2 inch thick
         2) NPS 2 and larger: Preformed glass fiber, 2 inch thick
      b. Outdoor Applications:
         1) All sizes: Preformed glass fiber, 2 inch thick with field applied jacket

B. Cooling Systems:
   1. Chilled Water:
      a. Indoor Applications:
         1) All sizes: Preformed glass fiber, 1-1/2 inch thick
      b. Outdoor Applications:
         1) All sizes: Preformed glass fiber, 2 inch thick with field applied jacket
   2. Refrigerant Suction and Hot Gas:
      a. Indoor Applications:
         1) All sizes: Flexible elastomeric, 1 inch thick
      b. Outdoor Applications:
         1) All sizes: Flexible elastomeric, 2 inch thick

END OF SECTION

SECTION 23 0800
COMMISSIONING OF HVAC

PART 1 GENERAL

1.01 SUMMARY

A. See Section 01 45 33 - Code Required Special Inspections and Procedures for overall objectives; comply with the requirements of Section 01 45 33.

B. This section covers the Contractor's responsibilities for commissioning; each subcontractor or installer responsible for the installation of a particular system or equipment item to be commissioned is responsible for the commissioning activities relating to that system or equipment item.

C. The Commissioning Authority (CA) directs and coordinates all commissioning activities and provides Prefunctional Checklists and Functional Test Procedures for Contractor's use.

D. The following HVAC equipment is to be commissioned, including commissioning activities for the following specific items:
   1. Control system.
   2. Major and minor equipment items.
   3. Piping systems and equipment.
   4. Ductwork and accessories.
   5. Terminal units.
   6. Other equipment and systems explicitly identified elsewhere in Contract Documents as requiring commissioning.

E. The Prefunctional Checklist and Functional Test requirements specified in this section are in addition to, not a substitute for, inspection or testing specified in other sections.

1.02 RELATED REQUIREMENTS

A. Section 23 0593 - Testing, Adjusting, and Balancing for HVAC.

B. Section 23 0913 - Instrumentation and Control Devices for HVAC.

C. Section 23 0923 - Direct-Digital Control System for HVAC.

1.03 REFERENCE STANDARDS

A. ASHRAE Guideline 1.1 - Application of the Commissioning Process to New HVAC&R Systems; 2025.

1.04 SUBMITTALS

A. Updated Submittals: Keep the Commissioning Authority informed of all changes to control system documentation made during programming and setup; revise and resubmit when substantial changes are made.

B. Draft Prefunctional Checklists and Functional Test Procedures for Control System: Detailed written plan indicating the procedures to be followed to test, checkout and adjust the control system prior to full system Functional Testing; include at least the following for each type of equipment controlled:
   1. System name.
   2. List of devices.
   3. Step-by-step procedures for testing each controller after installation, including:
      a. Process of verifying proper hardware and wiring installation.
      b. Process of downloading programs to local controllers and verifying that they are addressed correctly.
      c. Process of performing operational checks of each controlled component.
      d. Plan and process for calibrating valve and damper actuators and all sensors.

e. Description of the expected field adjustments for transmitters, controllers and control actuators should control responses fall outside of expected values.

4. Copy of proposed log and field checkout sheets to be used to document the process; include space for initial and final read values during calibration of each point and space to specifically indicate when a sensor or controller has “passed” and is operating within the contract parameters.
5. Description of the instrumentation required for testing.
6. Indicate what tests on what systems should be completed prior to TAB using the control system for TAB work. Coordinate with the Commissioning Authority and TAB contractor for this determination.

C. Startup Reports, Prefunctional Checklists, and Trend Logs: Submit for approval of Commissioning Authority.

D. HVAC Control System O&M Manual Requirements. In addition to documentation specified elsewhere, compile and organize at minimum the following data on the control system:
1. Specific step-by-step instructions on how to perform and apply all functions, features, modes, etc. mentioned in the controls training sections of this specification and other features of this system. Provide an index and clear table of contents. Include the detailed technical manual for programming and customizing control loops and algorithms.
2. Full as-built set of control drawings.
3. Full as-built sequence of operations for each piece of equipment.
4. Full points list; in addition to the information on the original points list submittal, include a listing of all rooms with the following information for each room:
   a. Floor.
   b. Room number.
   c. Room name.
   d. Air handler unit ID.
   e. Reference drawing number.
   f. Air terminal unit tag ID.
   g. Heating and/or cooling valve tag ID.
   h. Minimum air flow rate.
   i. Maximum air flow rate.
5. Full print out of all schedules and set points after testing and acceptance of the system.
6. Full as-built print out of software program.
7. Electronic copy on disk of the entire program for this facility.
8. Marking of all system sensors and thermostats on the as-built floor plan and HVAC drawings with their control system designations.
9. Maintenance instructions, including sensor calibration requirements and methods by sensor type, etc.
10. Control equipment component submittals, parts lists, etc.
11. Warranty requirements.
12. Copies of all checkout tests and calibrations performed by the Contractor (not commissioning tests).
13. Organize and subdivide the manual with permanently labeled tabs for each of the following data in the given order:
    a. Sequences of operation.
    b. Control drawings.
    c. Points lists.
    d. Controller and/or module data.
    e. Thermostats and timers.
    f. Sensors and DP switches.

g. Valves and valve actuators.
h. Dampers and damper actuators.
i. Program setups (software program printouts).

E. Project Record Documents: See Section 01 7800 for additional requirements.
1. Submit updated version of control system documentation, for inclusion with operation and maintenance data.
2. Show actual locations of all static and differential pressure sensors (air, water and building pressure) and air-flow stations on project record drawings.

F. Draft Training Plan: In addition to requirements specified in Section 01 7900, include:
1. Follow the recommendations of ASHRAE Guideline 1.1.
2. Control system manufacturer's recommended training.
3. Demonstration and instruction on function and overrides of any local packaged controls not controlled by the HVAC control system.

G. Training Manuals: See Section 01 7900 for additional requirements.
1. Provide three extra copies of the controls training manuals in a separate manual from the O&M manuals.

PART 2 PRODUCTS

2.01 TEST EQUIPMENT

A. Provide all standard testing equipment required to perform startup and initial checkout and required functional performance testing; unless otherwise noted such testing equipment will NOT become the property of Owner.

B. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Owner; such equipment, tools, and instruments are to become the property of Owner.

PART 3 EXECUTION

3.01 PREPARATION

A. Cooperate with the Commissioning Authority in development of the Prefunctional Checklists and Functional Test Procedures.

B. Furnish additional information requested by the Commissioning Authority.

C. Prepare a preliminary schedule for HVAC pipe and duct system testing, flushing and cleaning, equipment start-up and testing, adjusting, and balancing start and completion for use by the Commissioning Authority; update the schedule as appropriate.

D. Notify the Commissioning Authority when pipe and duct system testing, flushing, cleaning, startup of each piece of equipment and testing, adjusting, and balancing will occur; when commissioning activities not yet performed or not yet scheduled will delay construction notify ahead of time and be proactive in seeing that the Commissioning Authority has the scheduling information needed to efficiently execute the commissioning process.

E. Put all HVAC equipment and systems into operation and continue operation during each working day of testing, adjusting, and balancing and commissioning, as required.
1. Include cost of sheaves and belts that may be required for testing, adjusting, and balancing.

F. Provide test holes in ducts and plenums where directed to allow air measurements and air balancing; close with an approved plug.

G. Provide temperature and pressure taps in accordance with Contract Documents.

1. Provide a pressure/temperature plug at each water sensor that is an input point to the control system.

3.02 INSPECTING AND TESTING - GENERAL

A. Submit startup plans, startup reports, and Prefunctional Checklists for each item of equipment or other assembly to be commissioned.

B. Perform the Functional Tests directed by the Commissioning Authority for each item of equipment or other assembly to be commissioned.

C. Provide two-way radios for use during the testing.

D. Valve/Damper Stroke Setup and Check:
1. For all valve/damper actuator positions checked, verify the actual position against the control system readout.
2. Set pump/fan to normal operating mode.
3. Command valve/damper closed; visually verify that valve/damper is closed and adjust output zero signal as required.
4. Command valve/damper open; verify position is full open and adjust output signal as required.
5. Command valve/damper to a few intermediate positions.
6. If actual valve/damper position does not reasonably correspond, replace actuator or add pilot positioner (for pneumatics).

E. Isolation Valve or System Valve Leak Check: For valves not by coils.
1. With full pressure in the system, command valve closed.
2. Use an ultra-sonic flow meter to detect flow or leakage.

F. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner.

3.03 TAB COORDINATION

A. TAB: Testing, adjusting, and balancing of HVAC.

B. Coordinate commissioning schedule with TAB schedule.

C. Review the TAB plan to determine the capabilities of the control system toward completing TAB.

D. Provide all necessary unique instruments and instruct the TAB technicians in their use; such as handheld control system interface for setting terminal unit boxes, etc.

E. Have all required Prefunctional Checklists, calibrations, startup and component Functional Tests of the system completed and approved by the Commissioning Authority prior to starting TAB.

F. Provide a qualified control system technician to operate the controls to assist the TAB technicians or provide sufficient training for the TAB technicians to operate the system without assistance.

3.04 CONTROL SYSTEM FUNCTIONAL TESTING

A. Prefunctional Checklists for control system components will require a signed and dated certification that all system programming is complete as required to accomplish the requirements of Contract Documents and the detailed Sequences of Operation documentation submittal.

B. Do not start Functional Testing until all controlled components have themselves been successfully Functionally Tested in accordance with Contract Documents.

C. Using a skilled technician who is familiar with this building, execute the Functional Testing of the control system as required by the Commissioning Authority.

D. Functional Testing of the control system constitutes demonstration and trend logging of control points monitored by the control system.
   1. The scope of trend logging is partially specified; trend log up to 50 percent more points than specified at no extra cost to Owner.
   2. Perform all trend logging specified in Prefunctional Checklists and Functional Test procedures.

E. Functionally Test integral or stand-alone controls in conjunction with the Functional Tests of the equipment they are attached to, including any interlocks with other equipment or systems; further testing during control system Functional Test is not required unless specifically indicated below.

F. Demonstrate the following to the Commissioning Authority during testing of controlled equipment; coordinate with commissioning of equipment.
   1. Setpoint changing features and functions.
   2. Sensor calibrations.

G. Demonstrate to the Commissioning Authority:
   1. That all specified functions and features are set up, debugged and fully operable.
   2. That scheduling features are fully functional and setup, including holidays.
   3. That all graphic screens and value readouts are completed.
   4. Correct date and time setting in central computer.
   5. That field panels read the same time as the central computer; sample 10 percent of field panels; if any of those fail, sample another 10 percent; if any of those fail test all remaining units at no extra cost to Owner.
   6. Functionality of field panels using local operator keypads and local ports (plug-ins) using portable computer/keypad; demonstrate 100 percent of panels and 10 percent of ports; if any ports fail, sample another 10 percent; if any of those fail, test all remaining units at no extra cost to Owner.
   7. Power failure and battery backup and power-up restart functions.
   8. Global commands features.
   9. Security and access codes.
   10. Occupant over-rides (manual, telephone, key, keypad, etc.).
   11. O&M schedules and alarms.
   12. Occupancy sensors and controls.
   13. Fire alarm interlocks and response.
   14. That points that are monitored only, having no control function, are reporting properly to the control system.
   15. All control strategies and sequences not tested during controlled equipment testing.

H. If the control system, integral control components, or related equipment do not respond to changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice, under any of the conditions, sequences, or modes tested, correct all systems, equipment, components, and software required at no additional cost to Owner.

3.05 OPERATION AND MAINTENANCE MANUALS

A. See Section 01 7800 for additional requirements.

B. Add design intent documentation furnished by Architect to manuals prior to submission to Owner.

C. Submit manuals related to items that were commissioned to Commissioning Authority for review; make changes recommended by Commissioning Authority.

D. Commissioning Authority will add commissioning records to manuals after submission to Owner.

3.06 DEMONSTRATION AND TRAINING

A. See Section 01 7900 for additional requirements.

B. Demonstrate operation and maintenance of HVAC system to Owner' personnel; if during any demonstration, the system fails to perform in accordance with the information included in the O&M manual, stop demonstration, repair or adjust, and repeat demonstration. Demonstrations may be combined with training sessions if appropriate.

C. These demonstrations are in addition to, and not a substitute for, Prefunctional Checklists and demonstrations to the Commissioning Authority during Functional Testing.

D. Provide classroom and hands-on training of Owner's designated personnel on operation and maintenance of the HVAC system, control system, and all equipment items indicated to be commissioned. Provide the following minimum durations of training:

E. TAB Review: Instruct Owner's personnel for minimum eight hours, after completion of TAB, on the following:
   1. Review final TAB report, explaining the layout and meanings of each data type.
   2. Discuss any outstanding deficient items in control, ducting or design that may affect the proper delivery of air or water.
   3. Identify and discuss any terminal units, duct runs, diffusers, coils, fans and pumps that are close to or are not meeting their design capacity.
   4. Discuss any temporary settings and steps to finalize them for any areas that are not finished.
   5. Other salient information that may be useful for facility operations, relative to TAB.

F. HVAC Control System Training: Perform training in at least three phases:
   1. Phase 1 - Basic Control System: Provide minimum of eight hours of actual training on the control system itself. Upon completion of training, each attendee, using appropriate documentation, should be able to perform elementary operations and describe general hardware architecture and functionality of the system.
      a. This training may be held on-site or at the manufacturer's facility.
      b. If held off-site, the training may occur prior to final completion of the system installation.
      c. For off-site training, Contractor shall pay expenses of up to two attendees.
   2. Phase 2 - Integrating with HVAC Systems: Provide minimum of eight hours of on-site, hands-on training after completion of Functional Testing. Include instruction on:
      a. The specific hardware configuration of installed systems in this facility and specific instruction for operating the installed system, including interfaces with other systems, if any.
      b. Security levels, alarms, system start-up, shut-down, power outage and restart routines, changing setpoints and alarms and other typical changed parameters, overrides, freeze protection, manual operation of equipment, optional control strategies that can be considered, energy savings strategies and set points that if changed will adversely affect energy consumption, energy accounting, procedures for obtaining vendor assistance, etc.
      c. Trend logging and monitoring features (values, change of state, totalization, etc.), including setting up, executing, downloading, viewing both tabular and graphically and printing trends; provide practice in setting up trend logging and monitoring during training session.
      d. Every display screen, allowing time for questions.
      e. Point database entry and modifications.

3. Phase 3 - Post-Occupancy: Six months after occupancy conduct minimum of eight hours of training. Tailor training session to questions and topics solicited beforehand from Owner. Also be prepared to address topics brought up and answer questions concerning operation of the system.

G. Provide the services of manufacturer representatives to assist instructors where necessary.

H. Provide the services of the HVAC controls instructor at other training sessions, when requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.

END OF SECTION

SECTION 23 0913
INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Control panels.

B. Control Valves:
   1. Ball valves with factory-mounted actuators.
   2. Butterfly valves with factory-mounted actuators.
   3. Electronic valve operators.

C. Pressure independent valves and actuators.

D. Dampers.

E. Damper Operators:
   1. Electric operators.
   2. Inlet vane operators.

F. Wall-, Surface-, and Duct-Mounted Sensors:
   1. Temperature sensors.
   2. Humidity sensors.
   3. IAQ (indoor air quality) sensors.
   4. Building static pressure transmitters.
   5. Static air pressure sensors.
   6. Air pressure transmitters.
   7. Damper position indicators.
   8. Carbon monoxide sensors.
   9. Carbon dioxide sensors.

G. Thermostats:
   1. Freezestats.

H. Time switches.

I. Fan and pump motor run-status monitoring.

J. Pipe-Mounted Sensors and Transmitters:
   1. Temperature sensors.
   2. Differential pressure transmitters.
   3. Flow switches.
   4. Turbine/impeller flow meters.

K. Energy Metering:
   1. Hydronic energy meters.

1.02 RELATED REQUIREMENTS

A. Section 25 3513 - Integrated Automation Actuators and Operators.

B. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.

C. Section 26 2726 - Wiring Devices: Elevation of exposed components.

1.03 REFERENCE STANDARDS

A. ANSI/FCI 70-2 - Control Valve Seat Leakage; 2021.

B. ASHRAE Std 135 - BACnet - A Data Communication Protocol for Building Automation and Control Networks; 2024, with Errata (2025).

C. IEC 60529 - Degrees of Protection Provided by Enclosures (IP Code); 1989 (Corrigendum 2019).

D. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

E. UL 916 - Energy Management Equipment; Current Edition, Including All Revisions.

F. UL 917 - Clock-Operated Switches; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.

C. Shop Drawings: Indicate complete operating data, system drawings, wiring diagrams, and written detailed operational description of sequences. Submit schedule of valves indicating size, flow, and pressure drop for each valve. For automatic dampers indicate arrangement, velocities, and static pressure drops for each system.

PART 2 PRODUCTS

2.01 EQUIPMENT - GENERAL

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

2.02 CONTROL PANELS

A. Unitized cabinet type for each system under automatic control with relays and controls mounted in cabinet and temperature indicators, pressure gauges, pilot lights, push buttons and switches flush on cabinet panel face.

B. Provide common keying for all panels.

2.03 CONTROL VALVES

A. Ball Valves with Factory-Mounted Actuators:
   1. Service: Use for chilled water or hot water.
   2. Flow Characteristic: Include 2-way and 3-way diverting operation configured to fail as indicated on drawings.
   3. Replacements in Kind: Provide pressure-independent type.
   4. Rangeability: 500 to 1.
   5. ANSI Rating: Class 150.
   6. Leakage: Class IV (0.1 percent of rated capacity) per ANSI/FCI 70-2.
   7. Body Size:
      a. Under 2-1/2 inches:
         1) Connection: NPT.
         2) Materials:
            (a) Body: Brass.
            (b) Flanges: Ductile iron.
            (c) Ball: 300 series stainless steel.
            (d) Stem: 300 series stainless steel.
            (e) Seat: Graphite-reinforced PTFE with EPDM O-Ring backing.
            (f) Stem Seal: EPDM O-Rings.
            (g) Flow Control Disk: Thermoplastic synthetic-resin.
      b. 2-1/2 inches and Above:
         1) Connection Type: Flanged.
         2) Materials:
            (a) Body: Brass.

(b) Flanges: Ductile iron.
(c) Ball: 300 series stainless steel.
(d) Stem: 300 series stainless steel.
(e) Seat: Graphite-reinforced PTFE with EPDM O-Ring backing.
(f) Stem Seal: EPDM O-Rings.
(g) Flow Control Disk: Thermoplastic synthetic-resin.

c. Service Temperature:
1) Fluid Side: 0 to 284 degrees F liquid or 25 psig steam.
2) Ambient Side: From minus 4 to 122 degrees F.

8. Actuator Requirements:
a. Assembly: Field-mounted.
b. Input: 0 to 10 VDC configured as indicated on drawings.
c. Accessories: Provide with valve position indicator and manual override.

B. Butterfly Valves with Factory-Mount Actuators:
1. Iron body, stainless steel disc, resilient replaceable seat for service to 250 degrees F wafer or lug ends, extended neck.
2. Hydronic Systems:
a. Rate for service pressure of 125 psig at 250 degrees F.
b. Size for 1 psig maximum pressure drop at design flow rate.

C. Electronic Valve Actuators:
1. Valves shall spring return to normal position as indicated on freeze, fire, or temperature protection.

2.04 PRESSURE INDEPENDENT VALVES AND ACTUATORS

A. Size 2 inch and Smaller:
1. Provide ball style with flow balancing, flow measurement, and shut-off capabilities, memory stops, minimum of two metering ports and NPT threaded or soldered connections.
2. Metal construction materials consist of bronze or brass.
3. Nonmetal construction materials consist of Teflon, EPDM, or engineered resin.

B. Size 2.5 inch and Larger:
1. Provide ball, globe, or butterfly style with flow balancing, flow measurement, and shut-off capabilities, memory stops, minimum of two metering ports and flanged, grooved, or weld end connections.
2. Valve body construction materials consist of cast iron, carbon steel, or ductile iron.
3. Internal components construction materials consist of brass, aluminum bronze, bronze, Teflon, EPDM, NORYL, or engineered resin.

C. Actuator Requirements:
1. Assembly: Field-mounted.
2. Input: 0 to 10 VDC configured as indicated on drawings.
3. Accessories: Provide with manual override and valve position indicator.

2.05 DAMPERS

A. See Section 23 3300 for dampers and this section for actuators and operators.

2.06 DAMPER OPERATORS

A. General:
1. Provide actuators with torque capacity sized for minimum of 20 percent greater than maximum design stream velocity and hold tight seal against maximum system pressures.
2. Provide spring return for two position control and for fail safe operation.

3. Provide sufficient number of operators to achieve unrestricted movement throughout damper range.
4. Provide one operator for maximum 36 sq ft damper section.
5. See Section 25 3513 for field-mount damper actuators and operators.

B. Electric Operators:
1. Spring return, adjustable stroke motor having oil immersed gear train, with auxiliary end switch.

C. Inlet Vane Operators:
1. High pressure with pilot positioners and sufficient force to move vanes when fan is started with vanes in closed position. Return vane operator to closed position on fan shutdown.

2.07 WALL-, SURFACE-, AND DUCT-MOUNT SENSORS

A. Temperature Sensors:
1. Use thermistor or RTD type temperature sensing elements with characteristics resistant to moisture, vibration, and other conditions consistent with the application without affecting accuracy and life expectancy.
2. Construct RTD of nickel or platinum with base resistance of 1000 ohms at 70 degrees F.
3. 100 ohm platinum RTD is acceptable if used with project DDC controllers.
4. Temperature Sensing Device: Compatible with project DDC controllers.
5. Performance Characteristics:
a. RTD:
1) Room Sensor Accuracy: Plus/minus 0.50 degrees F minimum.
2) Duct Averaging Accuracy: Plus/minus 0.50 degrees F minimum.
3) Chilled Water Accuracy: Plus/minus 0.50 degrees F minimum.
4) All Other Accuracy: Plus/minus 0.75 degrees F minimum.
5) Range: Minus 40 degrees F through 220 degrees F minimum.
b. Thermistor:
1) Accuracy (All): Plus/minus 0.36 degrees F minimum.
2) Range: Minus 25 degrees F through 122 degrees F minimum.
3) Heat Dissipation Constant: 2.7 mW per degree C.
c. Sensing Range:
1) Provide limited range sensors if required to sense the range expected for a respective point.
2) Use RTD type sensors for extended ranges beyond minus 30 to 230 degrees F.
3) Use temperature transmitters in conjunction with RTDs when RTDs are incompatible with DDC controller direct temperature input.
d. Outside Air Sensors: Watertight inlet fitting shielded from direct rays of the sun.
e. Immersion Temperature Sensors: A sensor encased in a corrosion-resistant probe with an indoor junction box service entry body.
f. Room Temperature Sensors with Integral Digital Display:
1) Provide a four button keypad with the following capabilities:
(a) Indication of space and outdoor temperatures.
(b) Setpoint adjustment to accommodate room setpoint, DDC Input/Output Points List, and Sequence of Operation.
(c) Display and control fan operation status.
(d) Manual occupancy override and indication of occupancy status.
(e) Controller mode status.
(f) Password enabled setpoint and override modes.
g. Temperature Averaging Elements:
1) Use on duct sensors for ductwork 10 sq ft or larger.

2) Use averaging elements where prone to stratification with sensor length 8 ft or 16 ft.
3) Provide for all mixed air and heating coil discharge sensors regardless of duct size.

h. Insertion Elements:
1) Use in ducts not affected by temperature stratification or smaller than 11 sq inches.
2) Provide dry type, insertion elements for liquids, installed in immersion wells, with minimum insertion length of 2.5 inches.

B. Humidity Sensors, Duct-Mounted:
1. Replaceable digitally profiled thin-film capacitive sensor probe extended from die-cast metal, weather-proof plastic or metal housing designed for duct mounting.
2. Measuring Scale: 0 to 100 percent RH, noncondensing, temperature compensated.
3. Hardwired Output: Two-wire, 4 to 20 mA, loop powered.
4. Accuracy: Plus/minus 1 percent between 20 to 40 percent RH linear range, NIST traceable with multi-point calibration.

C. Humidity Transmitters, Surface-Mounted:
1. Plastic housing encased, wall-mounted, humidity indicatingsensor.
2. Humidity Sensor Type: Replaceable thin-film capacitive.
3. Accuracy: 1 percent at rated measuring scale and capable of withstanding 95 percent relative humidity without loss of calibration.
4. Output: Two-wire, 4 to 20 mA, 0 to 5 VDC or 0 to 10 VDC, non-loop powered, selectable.

D. IAQ (Indoor Air Quality) Sensors:
1. Form Factor: Surface mounted, desk mounted, or single-gang electrical-box-mounted module made of high-impact plastic or other resilient material.
2. CO2 (Carbon Dioxide) Monitoring Sensor:
a. Non-dispersive infrared (NDIR) type, 0 to 100 %RH range.
b. Accuracy: Plus/minus 30 ppm within three percent of measured value.
3. BAS, SCADA, or other Integrated Automation Link: ASHRAE Std 135 BACnet MS/TP.

E. Building Static Pressure Transmitters:
1. Single port for direct or tubing connection into wall or ceiling static pressure tip, direct acting, double bell, scale range 0.01 to 6.0 in-wc positive or negative, and sensitivity of 0.0005 in-wc. Transmit electronic signal to receiver with matching scale range.

F. Static-Air Pressure Sensors:
1. Unidirectional with ranges not exceeding 150 percent of maximum expected input.
2. Temperature compensate with typical thermal error or 0.06 percent of full scale in temperature range of 40 to 100 degrees F.
3. Accuracy: One percent of full scale with repeatability 0.3 percent.
4. Output: 0 to 5 vdc with power at 12 to 28 vdc.

G. Air Pressure Transmitters:
1. General: Provide dry air media, differential pressure transducers to monitor duct pressure.
2. Accuracy: Plus/minus 2 percent full scale of range with combined linearity and hysteresis.
3. Zero Adjust: Pushbutton auto-zero and digital input using 2-position terminal block.
4. Measuring Range: 1 to 10 in-wc, unidirectional or bidirectional.
5. Hardwired Output: 2-wire, loop-powered 4 to 20 mA, field selectable.
6. Proof and Burst Pressure (pressure differential): 3 and 5 psid.

H. Damper Position Indicators: Potentiometer mounted in enclosure with adjustable crank arm assembly connected to damper to transmit 0 to 100 percent damper travel.

I. Carbon Monoxide Sensors:
   1. Gas sensing module that holds fixed or replaceable carbon monoxide gas-sensor cartridge.
   2. Form Factor: IEC 60529, IP20 enclosure, single-gang electrical box mounted.
   3. Electromechanical sensor with 0 to 500 ppm measurement range.
   4. Accuracy: Plus/minus Five percent of range with 1 ppm resolution.
   5. Hardwired Output: Three-wire, 4 to 20 mA, loop powered.
   6. Alarm: Auxiliary dry contact relay driven by setpoint adjustable between 25 to 180 ppm.

J. Carbon Dioxide Sensors, Duct and Wall:
   1. General: Provide nondispersive infrared (NDIR), diffusion sampling CO2 sensors with integral transducers and linear output.
   2. Air Temperature: Range of 32 to 122 degrees F.
   3. Relative Humidity: Range of 0 to 95 percent (noncondensing).
   4. Calibration Characteristics:
      a. Automatically compensating algorithm for sensor drift due to sensor degradation.
      b. Maximum Drift: 2 percent.
      c. User calibratable with a minimum calibration interval of 5 years.
   5. Construction:
      a. Sensor Chamber: Noncorrosive material for neutral effect on carbon dioxide sample.
      b. Provide duct mounted sensors with duct probe designed to protect sensing element from dust accumulation and mechanical damage.
      c. Housing: High impact plastic.

2.08 THERMOSTATS

A. Low-Limit Temperature Cutout Switch:
   1. Configuration: Vapor-filled capillary.
   2. Probe Sensing Length: 20 feet.
   3. Setpoint Adjust Control: Screw, concealed with manual reset switch.
   4. Switch Type: SPDT, snap-action, form C in dust-protected enclosure.
   5. Sensing Range: 15 to 55 degrees F.
   6. Mounting: Locate on cooling coil intake side.
   7. Field Interface: Connect load line-voltage to starter.
   8. Electrical Rating: As indicated on drawings.

2.09 TIME SWITCHES

A. Digital Electronic Time Switches:
   1. Description: Factory-assembled, solid-state programmable controller with LCD display, listed and labeled as complying with UL 916 or UL 917.
   2. Program Capability:
      a. Astronomic Time Switches: Single channel, capable of different schedule for each day of the week with additional holiday schedule available to override normal schedule for selected days and field-configurable astronomic feature to automatically adjust for seasonal changes in sunrise and sunset times.
   3. Schedule Capacity: Not less than 16 programmable on/off operations.
   4. Provide automatic daylight savings time and leap year compensation.
   5. Provide power outage backup to retain programming and maintain clock.
   6. Manual Override: Capable of overriding current schedule both permanently and temporarily until next scheduled event.
   7. Input Supply Voltage: 120 VAC unless otherwise indicated.

8. Provide lockable enclosure; environmental type complying with NEMA EN 10250 as specified for the following installation locations:

2.10 FAN AND PUMP MOTOR RUN-STATUS MONITORING

A. Current Switches:
   1. Mini Solid-Core: 2-State, On/Off digital output of motor status with adjustable trip point to detect belt loss or mechanical failure.
   2. Mini Split-Core: 2-state, On/Off digital output of inverter-duty motor status with adjustable trip point to detect belt loss or mechanical failure.
   3. Solid Core: 2-state, On/Off digital output of motor status with adjustable trip point to detect belt loss or mechanical failure and built-in pilot duty relay.
   4. Split Core: 2-state, On/Off digital output of inverter-duty motor status with adjustable trip point to detect belt loss or mechanical failure and built-in pilot duty relay.
   5. Maximum AC Current Monitoring Value: As indicated on drawings.

B. Differential Pressure Switches:
   1. Fan Status: Select for adjustable range between 0 to 5 in-wc across fan discharge and external or fan inlet. Include static pressure tips.
   2. Pump Status: Select for adjustable range between 8 to 60 psi across pump discharge and suction sides. Include static pressure tips and 3-way valve manifold.

2.11 PIPE-MOUNTED SENSORS AND TRANSMITTERS

A. Temperature Sensors:
   1. Pipe-mounted temperature probe tied to weather-resistant enclosure for direct insertion into compatible liquids or gases or inserted into intermediary thermal grease-filled pipe-well compatible with interfaced fluid.
   2. Sensor Type: 1,000 ohm Platinum RTD.
   3. Transmitter: Fitted within probe-interface enclosure, calibrated.
      a. Monitoring Range: 32 to 122 degrees F, adjustable.
      b. Hardwired Output: Two-wire, 4 to 20 mA, loop powered.
      c. Accuracy: Plus/minus three percent. adjustable on the transmitter end.
   4. Accessories: Provide downstream PT test plug and brass pipe-well.

B. Differential Pressure Transmitters:
   1. General: Provide wet media differential pressure transducers with 6 ft (1.83 m) armored cable, to allow local or remote pressure sensing capability using existing plumbing runs.
      a. Input Power: Class 2; 15 to 30 VDC, 24VAC nominal, 50/60 Hz.
      b. Output: 3-wire transmitter; 4 to 20 mA, 0 to 5V, or 0 to 10V, selectable,
      c. Sensor:
         1) Media Compatibility: 17 to 4 PH stainless steel.
         2) Status Indication: Dual color LED.
         3) Proof Pressure: 2x max. F.S. range.
         4) Burst Pressure: 5x max. F.S. range.
         5) Accuracy at 77 degrees F for less than or equal 20 ft:
            (a) Ranges A and B: Plus/minus 1 percent F.S. typical.
            (b) Range C: Plus/minus 1.5 percent F.S. typical.
            (c) Range D: Plus/minus 2 percent F.S. typical.
         6) Surge Damping: Electronic; 1 second averaging.
         7) Long Term Stability: Plus/minus 0.25 percent.
      d. Pressure Ranges:
         1) 0 psi to 50 psi (Gauge): 5 psid/10 psid/25 psid/50 psid (pressure differential).
         2) 0 psi to 100 psi (Gauge): 10 psid/20 psid/50 psid/100 psid (pressure differential).

3) 0 psi to 250 psi (Gauge): 25 psid/50 psid/125 psid/250 psid (pressure differential).

e. Enclosure: NEMA EN 10250, Type 4.

C. Flow Switches:
1. Repetitive Accuracy: Plus/minus 10 percent of actual flow setting.
2. Switch Actuation: Adjustable over the operating range and sized for the application, such that the setpoint is between 25 and 75 percent of the full range.
3. Provide Form C snap-action contacts, rated for the application.
4. Furnish nonflexible paddle with magnetically actuated contacts, rated for service at a pressure greater than the installed conditions.

D. Turbine Flow Meters:
1. Insertion Type: Provide for 4 inch pipe with ball valve and threadolet.
2. Flow Capacity Range: As indicated on drawings.
3. Coated ductile iron case, polymer-based cap, test port, and hermetically sealed register with low flow indicator.
4. Pressure and Temperature: Up to 175 psi and 120 degrees F.
5. Accessories: Provide downstream PT test plug and sight flow indicator.

2.12 ENERGY METERING

A. Hydronic Energy Meters:
1. LCD-indicating Btu/h energy meter with wall-mounted hardware capable of being installed remotely for direct connection into field-mounted compatible flow meter and temperature sensors or probes for supply and return sides.
2. Factory configured to dynamically monitor, calculate, and output energy demand based on user configured field setting via the front panel keypad or computer interface.
3. Integral transmitter to provide a linear analog or configurable pulse output signal representing the energy rate.
4. Software Outputs: Energy demand, energy consumption, flow rate, supply temperature, return temperature, and temperature difference.
5. BAS, SCADA, or other Integrated Automation Link: ASHRAE Std 135 BACnet MS/TP.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that systems are ready to receive work.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check and verify location of thermostats with plans and room details before installation. Locate 48 inches above floor. Align with lighting switches and humidistats; see Section 26 2726.

C. Mount freeze protection thermostats using flanges and element holders.

D. Mount outdoor reset thermostats and outdoor sensors indoors, with sensing elements outdoors with sun shield.

E. Provide separable sockets for liquids and flanges for air bulb elements.

F. Provide thermostats in aspirating boxes in front entrances, gymnasiums, high security areas, and where indicated.

G. Provide valves with position indicators and with pilot positioners where sequenced with other controls.

H. Provide mixing dampers of opposed blade construction arranged to mix streams. Provide pilot positioners on mixed air damper motors.

I. Provide isolation (two-position) dampers of parallel blade construction.

J. Mount control panels adjacent to associated equipment on vibration free walls or free-standing angle iron supports. One cabinet may accommodate more than one system in same equipment room. Provide engraved plastic nameplates for instruments and controls inside cabinet and engraved plastic nameplates on cabinet face.

K. Provide conduit and electrical wiring in accordance with Section 26 0583. Electrical material and installation shall be in accordance with appropriate requirements of Division 26.

END OF SECTION

SECTION 23 0923
DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. System description.

B. Operator interface.

C. Controllers.

D. Power supplies and line filtering.

E. Controller software.

F. HVAC control programs.

1.02 RELATED REQUIREMENTS

A. Section 23 0913 - Instrumentation and Control Devices for HVAC.

B. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

A. ASHRAE Std 135 - BACnet - A Data Communication Protocol for Building Automation and Control Networks; 2024, with Errata (2025).

B. MIL-STD-810 - Environmental Engineering Considerations and Laboratory Tests; 2019h, with Editorial Revision (2022).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data for each system component and software module.

C. Shop Drawings:
   1. Indicate trunk cable schematic showing programmable control unit locations, and trunk data conductors.
   2. List connected data points, including connected control unit and input device.
   3. Indicate system graphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations. Provide demonstration digital media containing graphics.
   4. Show system configuration with peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.
   5. Indicate description and sequence of operation of operating, user, and application software.

D. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors.
   1. Revise shop drawings to reflect actual installation and operating sequences.
   2. Include submittals data in final "Record Documents" form.

E. Operation and Maintenance Data:
   1. Include interconnection wiring diagrams complete field installed systems with identified and numbered, system components and devices.
   2. Include keyboard illustrations and step-by-step procedures indexed for each operator function.
   3. Include inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.

F. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner s name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with minimum three years of documented experience.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a five year period after Substantial Completion.

C. Provide five year manufacturer's warranty for field programmable micro-processor based units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Base Bid: Automated Logic.

B. Alternate 3: Unify

2.02 SYSTEM DESCRIPTION

A. Automatic temperature control field monitoring and control system using field programmable micro-processor based units with communications to Building Management System specified in Section 23 09 23.

B. Base system on distributed system of fully intelligent, stand-alone controllers, operating in a multi-tasking, multi-user environment on token passing network, with central and remote hardware, software, and interconnecting wire and conduit.

C. Include computer software and hardware, operator input/output devices, control units, local area networks (LAN), sensors, control devices, actuators.

D. Controls for variable air volume terminals, radiation, reheat coils, unit heaters, fan coils, and the like when directly connected to the control units. Individual terminal unit control is specified in Section 23 0913.

E. Provide control systems consisting of thermostats, control valves, dampers and operators, indicating devices, interface equipment and other apparatus and accessories required to operate mechanical systems, and to perform functions specified.

F. Include installation and calibration, supervision, adjustments, and fine tuning necessary for complete and fully operational system.

2.03 OPERATOR INTERFACE

A. PC Based Work Station:
   1. Resides on high speed network with building controllers.
   2. Connected to server for full access to all system information.

B. Workstation, controllers, and control backbone to communicate using BACnet protocol and addressing.

C. BACnet protocol to comply with ASHRAE Std 135.

2.04 CONTROLLERS

A. Building Controllers:
   1. General:
      a. Manage global strategies by one or more, independent, standalone, microprocessor based controllers.

b. Provide sufficient memory to support controller's operating system, database, and programming requirements.
c. Share data between networked controllers.
d. Controller operating system manages input and output communication signals allowing distributed controllers to share real and virtual object information and allowing for central monitoring and alarms.
e. Utilize real-time clock for scheduling.
f. Continuously check processor status and memory circuits for abnormal operation.
g. Controller to assume predetermined failure mode and generate alarm notification upon detection of abnormal operation.
h. Communication with other network devices to be based on assigned protocol.

2. Communication:
   a. Controller to reside on a BACnet network using ISO 8802-3 (ETHERNET) Data Link/Physical layer protocol.
   b. Perform routing when connected to a network of custom application and application specific controllers.
   c. Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol.
3. Anticipated Environmental Ambient Conditions:
   a. Outdoors and/or in Wet Ambient Conditions:
      1) Mount within waterproof enclosures.
   b. Conditioned Space:
      1) Mount within dustproof enclosures.
4. Provisions for Serviceability:
   a. Diagnostic LEDs for power, communication, and processor.
   b. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.
5. Memory: In the event of a power loss, maintain all BIOS and programming information for a minimum of 72 hours.
6. Power and Noise Immunity:
   a. Maintain operation at 90 to 110 percent of nominal voltage rating.
   b. Perform orderly shutdown below 80 percent of nominal voltage.
   c. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W. at 3 feet.

B. Custom Application Controller:
1. General:
   a. Provide sufficient memory to support controller's operating system, database, and programming requirements.
   b. Share data between networked, microprocessor based controllers.
   c. Controller operating system manages input and output communication signals allowing distributed controllers to share real and virtual object information and allowing for central monitoring and alarms.
   d. Utilize real-time clock for scheduling.
   e. Continuously check processor status and memory circuits for abnormal operation.
   f. Controller to assume predetermined failure mode and generate alarm notification upon detection of abnormal operation.
   g. Communication with other network devices to be based on assigned protocol.
2. Communication:
   a. Controller to reside on a BACnet network using MS/TP Data Link/Physical layer protocol.

b. Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol.

3. Anticipated Environmental Ambient Conditions:
   a. Outdoors and/or in Wet Ambient Conditions:
      1) Mount within waterproof enclosures.
   b. Conditioned Space:
      1) Mount within dustproof enclosures.
4. Provisions for Serviceability:
   a. Diagnostic LED's for power, communication, and processor.
   b. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.
5. Memory: In the event of a power loss, maintain all BIOS and programming information for a minimum of 72 hours.
6. Power and Noise Immunity:
   a. Maintain operation at 90 to 110 percent of nominal voltage rating.
   b. Perform orderly shutdown below 80 percent of nominal voltage.
   c. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W. at 3 feet.

C. Application Specific Controllers:
1. General:
   a. Not fully user programmable, microprocessor based controllers dedicated to control specific equipment.
   b. Customized for operation within the confines of equipment served.
   c. Communication with other network devices to be based on assigned protocol.
2. Communication:
   a. Controller to reside on a BACnet network using MS/TP Data Link/Physical layer protocol.
   b. Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol.
3. Anticipated Environmental Ambient Conditions:
   a. Outdoors and/or in Wet Ambient Conditions:
      1) Mount within waterproof enclosures.
   b. Conditioned Space:
      1) Mount within dustproof enclosures.
4. Provisions for Serviceability:
   a. Diagnostic LEDs for power, communication, and processor.
   b. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.
5. Memory: In the event of a power loss, maintain all BIOS and programming information for a minimum of 72 hours.
6. Power and Noise Immunity:
   a. Maintain operation at 90 to 110 percent of nominal voltage rating.
   b. Perform orderly shutdown below 80 percent of nominal voltage.
   c. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 3 feet.

D. Input/Output Interface:
1. Hardwired inputs and outputs tie into the DDC system through building, custom application, or application specific controllers.
2. All Input/Output Points:

a. Protect controller from damage resulting from any point short-circuiting or grounding and from voltage up to 24 volts of any duration.
b. Provide universal type for building and custom application controllers where input or output is software designated as either binary or analog type with appropriate properties.

3. Binary Inputs:
   a. Allow monitoring of On/Off signals from remote devices.
   b. Provide wetting current of 12 mA minimum, compatible with commonly available control devices and protected against the effects of contact bounce and noise.
   c. Sense dry contact closure with power provided only by the controller.
4. Pulse Accumulation Input Objects: Comply with all requirements of binary input objects and accept up to 10 pulses per second.
5. Analog Inputs:
   a. Allow for monitoring of low voltage 0 to 10 VDC, 4 to 20 mA current, or resistance signals (thermistor, RTD).
   b. Compatible with and field configurable to commonly available sensing devices.
6. Binary Outputs:
   a. Used for On/Off operation or a pulsed low-voltage signal for pulse width modulation control.
   b. Outputs provided with three position (On/Off/Auto) override switches.
   c. Status lights for building and custom application controllers to be selectable for normally open or normally closed operation.
7. Analog Outputs:
   a. Monitoring signal provides a 0 to 10 VDC or a 4 to 20 mA output signal for end device control.
   b. Provide status lights and two position (AUTO/MANUAL) switch for building and custom application controllers with manually adjustable potentiometer for manual override on building and custom application controllers.
   c. Drift to not exceed 0.4 percent of range per year.
8. Tri State Outputs:
   a. Coordinate two binary outputs to control three point, floating type, electronic actuators without feedback.
   b. Limit the use of three point, floating devices to the following zone and terminal unit control applications:
      1) VAV terminal units.
   c. Control algorithms run the zone actuator to one end of its stroke once every 24 hours for verification of operator tracking.
9. System Object Capacity:
   a. System size to be expandable to twice the number of input output objects required by providing additional controllers, including associated devices and wiring.
   b. Hardware additions or software revisions for the installed operator interfaces are not to be required for future, system expansions.

2.05 POWER SUPPLIES AND LINE FILTERING

A. Power Supplies:
1. Provide UL listed control transformers with Class 2 current limiting type or over-current protection in both primary and secondary circuits for Class 2 service as required by the NEC.
2. Limit connected loads to 80 percent of rated capacity.
3. Match DC power supply to current output and voltage requirements.
4. Unit to be full wave rectifier type with output ripple of 5.0 mV maximum peak to peak.

5. Regulation to be 1 percent combined line and load with 100 microsecond response time for 50 percent load changes.
6. Provide over-voltage and over-current protection to withstand a 150 percent current overload for 3 seconds minimum without trip-out or failure.
7. Operational Ambient Conditions: 32 to 120 degrees F.
8. EM/RF meets FCC Class B and VDE 0871 for Class B and MIL-STD-810 for shock and vibration.
9. Line voltage units UL recognized and CSA approved.

B. Power Line Filtering:
1. Provide external or internal transient voltage and surge suppression component for all workstations and controllers.
2. Minimum surge protection attributes:
a. Dielectric strength of 1000 volts minimum.
b. Response time of 10 nanoseconds or less.
c. Transverse mode noise attenuation of 65 dB or greater.
d. Common mode noise attenuation of 150 dB or greater at 40 to 100 Hz.

2.06 CONTROLLER SOFTWARE

A. All applications reside and operate in the system controllers and editing of all applications occurs at the operator workstation.

B. System Security:
1. User access secured via user passwords and user names.
2. Passwords restrict user to the objects, applications, and system functions as assigned by the system manager.
3. User Log On/Log Off attempts are recorded.
4. Automatic Log Off occurs following the last keystroke after a user defined delay time.

C. Object or Object Group Scheduling:
1. Weekly Schedules Based on Separate, Daily Schedules:
a. Include start, stop, optimal stop, and night economizer.
b. 10 events maximum per schedule.
c. Start/stop times adjustable for each group object.

D. Provide standard application for equipment coordination and grouping based on function and location to be used for scheduling and other applications.

E. Alarms:
1. Binary object is set to alarm based on the operator specified state.
2. Analog object to have high/low alarm limits.
3. All alarming is capable of being automatically and manually disabled.
4. Alarm Reporting:
a. Operator determines action to be taken for alarm event.
b. Alarms to be routed to appropriate workstation.
c. Reporting Options:

F. Maintenance Management: System monitors equipment status and generates maintenance messages based upon user-designated run-time limits.

G. Sequencing: Application software based upon specified sequences of operation in Contract Drawings

H. PID Control Characteristics:
1. Direct or reverse action.
2. Anti-windup.

3. Calculated, time-varying, analog value, positions an output or stages a series of outputs.
4. User selectable controlled variable, set-point, and PED gains.

I. Staggered Start Application:
1. Prevents all controlled equipment from simultaneously restarting after power outage.
2. Order of equipment startup is user selectable.

J. Energy Calculations:
1. Accumulated instantaneous power or flow rates are converted to energy use data.
2. Algorithm calculates a rolling average and allows window of time to be user specified in minute intervals.
3. Algorithm calculates a fixed window average with a digital input signal from a utility meter defining the start of the window period that in turn synchronizes the fixed-window average with that used by the power company.

K. Anti-Short Cycling:
1. All binary output objects protected from short-cycling.
2. Allows minimum on-time and off-time to be selected.

L. On-Off Control with Differential:
1. Algorithm allows binary output to be cycled based on a controlled variable and set-point.
2. Algorithm to be direct-acting or reverse-acting incorporating an adjustable differential.

M. Run-Time Totalization:
1. Totalize run-times for all binary input objects.
2. Provides operator with capability to assign high run-time alarm.

2.07 HVAC CONTROL PROGRAMS

A. General:
1. Support Inch-pounds and SI (metric) units of measurement.
2. Identify each HVAC Control system.

B. Optimal Run Time:
1. Control start-up and shutdown times of HVAC equipment for both heating and cooling.
2. Base on occupancy schedules, outside air temperature, seasonal requirements, and interior room mass temperature.
3. Start-up systems by using outside air temperature, room mass temperatures, and adaptive model prediction for how long building takes to warm up or cool down under different conditions.
4. Use outside air temperature to determine early shut down with ventilation override.
5. Analyze multiple building mass sensors to determine seasonal mode and worse case condition for each day.

C. Supply Air Reset:
1. Monitor heating and cooling loads in building spaces, terminal reheat systems, both hot deck and cold deck temperatures on dual duct and multizone systems, single zone unit discharge temperatures.
2. Adjust discharge temperatures to most energy efficient levels satisfying measured load by:
   a. Raising cooling temperatures to highest possible value.
   b. Reducing heating temperatures to lowest possible level.

D. Enthalpy Switchover:
1. Calculate outside and return air enthalpy using measured temperature and relative humidity; determine energy expended and control outside and return air dampers.

2.08 CHILLER CONTROL PROGRAMS

A. Control function of condenser water reset, chilled water reset, and chiller sequencing. Support inch-pounds and SI (metric) units of measurement.

B. Condenser Water Reset: Automatically reset controlled condenser water temperature using measured outside wet bulb temperature and load being handled.

C. Chilled Water Reset: Automatically reset controlled chilled water temperature satisfying cooling coil requiring greatest cooling.

D. Chiller Sequencing: Determine which combination of chillers will most efficiently satisfy chilled water load, by cycling chillers, based on comparing load to switchover limits defined for each chiller.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that conditioned power supply is available to the control units and to the operator work station. Verify that field end devices, wiring, and pneumatic tubing is installed prior to installation proceeding.

3.02 INSTALLATION

A. Install control units and other hardware in position on permanent walls where not subject to excessive vibration.

B. Install software in control units and in operator work station. Implement all features of programs to specified requirements and appropriate to sequence of operation.

C. Provide conduit and electrical wiring in accordance with Section 26 0583. Electrical material and installation shall be in accordance with appropriate requirements of Division 26.

3.03 MANUFACTURER'S FIELD SERVICES

A. Start and commission systems. Allow sufficient time for start-up and commissioning prior to placing control systems in permanent operation.

B. Provide service engineer to instruct Owner's representative in operation of systems plant and equipment for 3 day period.

3.04 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate complete and operating system to Owner.

END OF SECTION

SECTION 23 0934
VARIABLE-FREQUENCY MOTOR CONTROLLERS FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Variable-frequency motor controllers for low-voltage (600 V and less) AC motor applications.

1.02 RELATED REQUIREMENTS

A. Section 23 0529 - Hangers and Supports for HVAC Piping and Equipment.

B. Section 23 0553 - Identification for HVAC Piping and Equipment: Identification products and requirements.

C. Section 26 0526 - Grounding and Bonding for Electrical Systems.

D. Section 26 0573 - Power System Studies: Additional criteria for selection and adjustment of equipment and associated protective devices specified in this section.

E. Section 28 4600 - Fire Detection and Alarm: For interface with variable-frequency motor controllers.

1.03 REFERENCE STANDARDS

A. IEC 60529 - Degrees of Protection Provided by Enclosures (IP Code); 1989 (Corrigendum 2019).

B. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

C. NEMA IA 10030 - Industrial Control and Systems: Enclosures; 2024.

D. NEMA IS 10033 - Industrial Control and Systems: Adjustable-Speed Drives; 2026.

E. NEMA IS 10034 - Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable Speed Drive Systems; 2022 (Reapproved 2025).

F. NEMA IS 10035 - Application Guide for AC Adjustable Speed Drive Systems; 2021 (Reaffirmed 2025).

G. 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; 2023.

H. NEMA MG 00001 - Motors and Generators; 2024.

I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.

K. 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.

1.04 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.

1.05 SUBMITTALS

A. See Section 01 3000 - 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. 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. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.07 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.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. ABB

B. Danfoss.

C. Yaskawa.

D. Substitutions: See Section 01 6000 - Product Requirements.

2.02 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. Controller Assemblies: Comply with NEMA IS 10033, NEMA IS 10034, and NEMA ICS 61800-2; list and label as complying with UL 61800-5-1 or UL 508A as applicable.

D. Provide controllers selected for actual installed motors and coupled mechanical loads in accordance with NEMA IS 10035, 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.

E. Devices on Load Side of Controller: Suitable for application across full controller output frequency range.

F. 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.

G. 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 unless otherwise indicated.

H. 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 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.
   h. Safety Interlock: Provide permissive run safety interlock capability where indicated or required; upon activation of designated input, stop and prevent operation of motor; operational in both drive and bypass modes where applicable.
   i. Damper/Valve Control: Provide damper/valve control capability where indicated or required; upon receiving motor start command, activate designated damper/valve output and delay motor start until activation of designated end switch input confirms damper/valve operation.
4. Status Indications:
   a. Motor run/stop status.
   b. Motor forward/reverse status.
   c. Local/remote 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): Six.
   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. 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.
   c. Remote Control Capabilities:
      1) Motor run/stop command.
      2) Hand-off-auto selection.
      3) Speed adjustment.
      4) Fault reset.
9. Features:
   a. Password-protected security access.
   b. Event log.

I. Power Conditioning/Filtering:
   1. Provide DC link choke or input/line reactor for each controller unless otherwise indicated or required.
   2. Reactor Impedance: 3 percent, unless otherwise indicated or required.

J. 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. Provide auxiliary interlock for disconnection of external control power sources where applicable.
   2. Provide door-mounted remote operator interface.

K. 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.

L. Short Circuit Current Rating:
   1. Provide controllers with listed short circuit current rating not less than available fault current at installed location as determined by short circuit study performed in accordance with Section 26 0573.
   2. Provide line/input reactors where specified by manufacturer for required short circuit current rating.

M. Conductor Terminations: Suitable for use with conductors to be installed.

N. Enclosures:
   1. Comply with NEMA IA 10030.
   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.

O. Interface with Other Work:
   1. Provide products compatible with other systems requiring interface with controllers.
   2. Interface with building automation system as specified in Section 23 09 23.
      a. Capable of remote monitoring and control of controllers.
   3. Interface with fire alarm control system as specified in Section 28 4600.
      a. Capable of affecting operation of selected HVAC equipment for selected fire alarm system events.

PART 3 EXECUTION

3.01 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.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install in accordance with NEMA IS 10034 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 0529.

F. Install controllers plumb and level.

G. Provide grounding and bonding in accordance with Section 26 0526.

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.

K. Identify controllers in accordance with Section 23 0553.

3.03 PROTECTION

A. Protect installed controllers from subsequent construction operations.

END OF SECTION

SECTION 23 2113
HYDRONIC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hydronic system requirements.
B. Heating water piping, above grade.
C. Chilled water piping, buried.
D. Chilled water piping, above grade.
E. Equipment drains and overflows.
F. Pipe hangers and supports.
G. Unions, flanges, mechanical couplings, and dielectric connections.
H. Valves:

1.02 RELATED REQUIREMENTS

A. Section 08 3100 - Access Doors and Panels.
B. Section 23 0516 - Expansion Fittings and Loops for HVAC Piping.
C. Section 23 0719 - HVAC Piping Insulation.
D. Section 23 2500 - HVAC Water Treatment: Pipe cleaning.

1.03 REFERENCE STANDARDS

A. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.
B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.
C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.
D. ASME B31.9 - Building Services Piping; 2025.
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; 2025, with Errata.
B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.
C. ASTM A106/A106M - Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service; 2026.
D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.
E. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2025.
F. ASTM A536 - Standard Specification for Ductile Iron Castings; 2024.
G. ASTM B32 - Standard Specification for Solder Metal; 2020.
H. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.
I. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.
J. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2021a.
K. ASTM D2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series); 2025a.

L. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40; 2024.

M. ASTM D2467 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80; 2024.

N. 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 (Reapproved 2024).

O. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers; 2024.

P. ASTM F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications; 2007 (Reapproved 2024).

Q. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2019.

R. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025, with Amendment (2026).

S. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2018.

T. AWWA C606 - Grooved and Shouldered Joints; 2022.

U. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2025.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Welders Certificate: Include welders certification of compliance with ASME BPVC-IX.

C. Product Data:
   1. Include data on pipe materials, pipe fittings, valves, and accessories.
   2. Indicate valve data and ratings.
   3. Show grooved joint couplings, fittings, valves, and specialties on drawings and product submittals, specifically identified with the manufacturer's style or series designation.

D. Shop Drawings: Indicate pipe fittings, particulars such as gages, sizes, and configuration prior to start of work for all piping systems. Provide drawings in 1/4" per foot scale or larger.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum three years of documented experience.

B. Provide all grooved joint couplings, fittings, valves, specialties, and grooving tools from a single manufacturer.

C. Welder Qualifications: Certify in accordance with ASME BPVC-IX.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.07 FIELD CONDITIONS

A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.01 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 accessible locations only.
      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.
         1) Ductile Iron: Comply with ASTM A536, Grade 65-45-12.
         2) Steel: Comply with ASTM A106/A106M, Grade B or ASTM A53/A53M.
      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.
   1. Where grooved joints are used in piping, provide grooved valve/equipment connections if available; if not available, provide flanged ends and grooved flange adapters.

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. Isolate equipment using butterfly valves with lug end flanges or grooved mechanical couplings.
   3. For throttling, bypass, or manual flow control services, use ball or butterfly valves.
   4. For shut-off and to isolate parts of systems or vertical risers, use gate, ball, or butterfly valves.

E. Welding Materials and Procedures: Comply with ASME BPVC-IX.

2.02 HEATING WATER PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M, 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. Tee Connections: Mechanically extracted collars with notched and dimpled branch tube.
   3. Mechanical Press Sealed Fittings: Double pressed type complying with ASME B16.22, utilizing EPDM, nontoxic synthetic rubber sealing elements.

2.03 CHILLED WATER PIPING, BURIED

A. Steel Pipe: ASTM A53/A53M, Schedule 40, black with AWWA C105/A21.5 polyethylene jacket, or double layer, half-lapped polyethylene tape.

1. Fittings: ASTM A234/A234M, wrought steel welding type with double layer, half-lapped polyethylene tape.
2. Joints: Welded in accordance with AWS D1.1/D1.1M.
3. Casing: Closed glass cell insulation.

2.04 CHILLED WATER PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M, 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. Tee Connections: Mechanically extracted collars with notched and dimpled branch tube.
   3. Mechanical Press Sealed Fittings: Double pressed type complying with ASME B16.22, utilizing EPDM, nontoxic synthetic rubber sealing elements.

2.05 EQUIPMENT DRAINS AND OVERFLOWS

A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), 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; ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.

B. PVC Pipe: ASTM D1785, Schedule 40, or ASTM D2241, SDR 21 or 26.
   1. Fittings: ASTM D2466 or D2467, PVC.
   2. Joints: Solvent welded in accordance with ASTM D2855.

2.06 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. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
   9. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

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.

C. Rooftop Supports for Low-Slope Roofs: Steel pedestals with bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified; and as follows:

1. Bases: High-density polypropylene.
2. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
3. Steel Components: Stainless steel or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
4. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion-resistant material.
5. Height: Provide minimum clearance of 6 inches under pipe to top of roofing.

2.07 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.

PART 3 EXECUTION

3.01 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 2500 for additional requirements.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.

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. Slope piping and arrange to drain at low points.

H. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. See Section 23 0516.
   1. Flexible couplings may be used in header piping to accommodate thermal growth, thermal contraction in lieu of expansion loops.

I. Grooved Joints:
   1. Install in accordance with the manufacturer's latest published installation instructions.
   2. Gaskets to be suitable for the intended service, molded, and produced by the coupling manufacturer.

J. Inserts:
   1. Provide inserts for placement in concrete formwork.
   2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
   3. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
   4. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

K. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.9, ASTM F708, or MSS SP-58.
   2. Support horizontal piping as scheduled.
   3. Install hangers to provide minimum 1/2-inch space between finished covering and adjacent work.
   4. Place hangers within 12 inches of each horizontal elbow.
   5. Use hangers with 1-1/2 inches minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
   6. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
   7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
   8. Provide copper plated hangers and supports for copper piping.

L. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. See Section 23 0719.

M. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Section 08 3100 .

N. Use eccentric reducers to maintain top of pipe level.

O. Install valves with stems upright or horizontal, not inverted.

END OF SECTION

SECTION 23 2114
HYDRONIC SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Compression tanks.
B. Expansion tanks.
C. Air vents.
D. Air separators.
E. Strainers.
F. Suction diffusers.
G. Combination pump discharge valves.
H. Pressure-temperature test plugs.
I. Relief valves.
J. Pressure reducing valves.

1.02 RELATED REQUIREMENTS

A. Section 22 1006 - Plumbing Piping Specialties: Backflow preventers.
B. Section 23 2113 - Hydronic Piping.

1.03 REFERENCE STANDARDS

A. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1: Rules for Construction of Pressure Vessels; 2025, with Errata .

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.
B. Product Data: Provide product data for manufactured products and assemblies required for this project. Include component sizes, rough-in requirements, service sizes, and finishes. Include product description and model.
C. Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.01 COMPRESSION TANKS

A. Construction: Closed, welded steel, tested, and stamped in accordance with ASME BPVC-VIII-1; cleaned, prime coated, and supplied with steel support saddles; with tappings for installation of accessories.
   1. Pressure Rating: 100 psi.
B. Gauge Glass Set: Brass compression stops, guard, and 3/4 inch red line glass, maximum 24 inches length, long enough to cover tank for 2 inches above bottom to 2 inches below top.

C. Quick Connect Air Inlet:
   1. Compressed Air: 72 inches of 1/4 inch diameter braided reinforced air hose, air chuck, check valve, and shut-off valve on supply from control air compressor.
   2. Expansion Tank: Inlet tire check valve, manual air vent, tank drain, and pressure relief valve.

D. Automatic Cold Water Fill Assembly: Pressure reducing valve, reduced pressure, double check backflow preventer, test cocks, strainer, vacuum breaker, and valved by-pass. Refer to Section 22 1006.

2.02 EXPANSION TANKS

A. Construction: Welded steel, tested and stamped in accordance with ASME BPVC-VIII-1; supplied with National Board Form U-1, adjustable flexible EPDM diaphragm or bladder seal factory precharged to 12 psi, and steel support stand.

B. Automatic Cold Water Fill Assembly: Pressure reducing valve, reduced pressure double check backflow preventer, test cocks, strainer, vacuum breaker, and valved by-pass.

2.03 AIR VENTS

A. Manual Air Vent: Short vertical sections of 2-inch diameter pipe to form air chamber, with 1/8 inch brass needle valve at top of chamber.

B. Float Air Vent:
   1. Brass or semi-steel body, copper, polypropylene, or solid non-metallic float, stainless steel valve and valve seat; suitable for system operating temperature and pressure; with isolating valve.

C. Maximum Fluid Pressure: 150 psi.

D. Maximum Fluid Temperature: 250 degrees F.

2.04 AIR SEPARATORS

A. In-line Air Separators:
   1. Cast iron for sizes 1-1/2 inch and smaller, or steel for sizes 2 inch and larger; tested and stamped in accordance with ASME BPVC-VIII-1; for 125 psi operating pressure.
   2. Maximum Allowable Service Temperature: 450 degrees F.
   3. Accessories: Provide epoxy coating finish, drain ball valve, and removable strainer.

B. Coalescing Air/Dirt Separators:
   1. Tank: Fabricated steel tank; tested and stamped in accordance with ASME BPVC-VIII-1 for maximum fluid service subject to application requirements and manufacturer's standard maximum operating conditions.
   2. Coalescing Medium: Provide structured copper or stainless steel medium filling the entire vessel to suppress turbulence and provide air elimination efficiency of 100 percent free air, 100 percent entrained air, and 99.6 percent dissolved air at the installed location.
   3. Air Vent: Integral float actuated air vent at top fitting of tank rated at 150 psi, threaded to top of separator.
   4. End Connections: Class 150 flanged for 2-1/2 inch and larger otherwise threaded.
   5. Blowdown Connection: Threaded.
   6. Size: Match system flow capacity.
   7. Maximum Fluid Service Pressure: 150 psi.
   8. Maximum Fluid Service Temperature: 250 degrees F.

2.05 STRAINERS

A. Size 2 inch and Under:
   1. Provide threaded, grooved, or sweat brass or iron body for up to 175 psi working pressure, Y-pattern strainer with 1/32 inch stainless steel perforated screen.

B. Size 2-1/2 inch to 4 inch:
   1. Provide flanged or grooved iron body for up to 175 psi working pressure, up to 250 degrees F working temperature, Y-pattern strainer with 1/16 inch or 3/64 inch stainless steel perforated screen.

C. Size 5 inch and Larger:
   1. Provide flanged or grooved iron body for up to 175 psi working pressure, basket pattern with 1/8 inch stainless steel perforated screen.

2.06 SUCTION DIFFUSERS

A. Fitting: Angle pattern, cast-iron body, threaded for 2 inch and smaller, flanged for 2-1/2 inch and larger, rated for 175 psi working pressure, with inlet vanes, cylinder strainer with 3/16 inch diameter openings, disposable 5/32 inch mesh strainer to fit over cylinder strainer, 20 mesh startup screen, and permanent magnet located in flow stream and removable for cleaning.

B. Class 125:
   1. Horizontally or vertically mounted angle-pattern fitting with integral-cast vanes, fine particle mesh screen and magnetic drain plugs for particle removal without disassembly.
   2. Maximum Operating Service: 175 psi and 300 degrees F.
   3. Sizes, Material, and Connection:
      a. 2 inch and Smaller: Cast iron body, threaded.
      b. 2-1/2 to 12 inch: Ductile iron body, flanged.

C. Accessories: Adjustable foot support, blowdown tapping in bottom, gauge tapping in side.

2.07 PUMP CONNECTORS

A. Flexible Connectors: Flanged, braided type with wetted components of stainless steel, sized to match piping.
   1. Maximum Operating Service: 150 psi at 120 degrees F.
   2. Accommodate the Following:
      a. Axial Deflection in Compression and Expansion: _____ inch.
      b. Lateral Movement: _____ inch.
      c. Angular Rotation: 15 degrees.
      d. Force developed by 1.5 times specified maximum allowable operating pressure.
   3. End Connections: Same as specified for pipe jointing.
   4. Provide necessary accessories including, but not limited to, swivel joints.

2.08 COMBINATION PUMP DISCHARGE VALVES

A. Triple-Duty Globe Type: Flanged cast-iron angle pattern body with bolt-on bonnet, position indicator, non-slam check valve with spring-loaded bronze disc and seat, stainless steel stem, metering connectors, flow shutoff mechanism, and adjustable flow handle.

2.09 PRESSURE-TEMPERATURE TEST PLUGS

A. Construction: Brass body designed to receive temperature or pressure probe with removable protective cap, and Neoprene rated for minimum 200 degrees F.

B. Application: Use extended length plugs to clear insulated piping.

2.10 RELIEF VALVES

A. Bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labelled.

2.11 PRESSURE REDUCING VALVES

A. Operation: Automatically feeds make-up water to the hydronic system whenever pressure in the system drops below the pressure setting of the valve. Refer to Section 23 2113.

B. Materials of Construction:

1. Valve Body: Constructed of bronze, cast iron, brass, iron, or _____.
2. Internal Components: Construct of stainless steel, brass, or _____ and engineered plastics, composition material, or _____.

C. Connections:
1. NPT threaded: 1/2 inch or 3/4inch.
2. Soldered: 1/2 inch.

D. Provide integral check valve and strainer.

E. Maximum Inlet Pressure: 400 psi.

F. Maximum Fluid Temperature: 180 degrees F.

G. Adjustable Pressure Range: From 10 to 45 psi, set to 25 psi.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install specialties in accordance with manufacturer's instructions.

B. Provide manual air vents at system high points and as indicated.

C. For automatic air vents in ceiling spaces or other concealed locations, provide vent tubing to nearest drain.

D. Provide air separator on suction side of system circulation pump and connect to expansion tank.

E. Provide valved drain and hose connection on strainer blowdown connection.

F. Provide pump suction fitting on suction side of base-mounted centrifugal pumps where indicated. Remove temporary strainers after cleaning systems.

G. Provide combination pump discharge valve on discharge side of base mounted centrifugal pumps where indicated.

H. Support pump fittings with floor-mounted pipe and flange supports.

I. Provide relief valves on pressure tanks, low-pressure side of reducing valves, heat exchangers, and expansion tanks.

J. Select system relief valve capacity so that it is greater than make-up pressure reducing valve capacity. Select equipment relief valve capacity to exceed rating of connected equipment.

K. Pipe relief valve outlet to nearest floor drain.

L. Where one line vents several relief valves, make cross-sectional area equal to sum of individual vent areas.

END OF SECTION

SECTION 23 2123
HYDRONIC PUMPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Circulators.

B. In-line pumps.

C. End-suction pumps.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete.

B. Section 23 0513 - Common Motor Requirements for HVAC Equipment.

C. Section 23 0934 - Variable-Frequency Motor Controllers for HVAC.

D. Section 25 3500 - Integrated Automation Instrumentation and Terminal Devices for HVAC.

1.03 REFERENCE STANDARDS

A. ASHRAE Std 135 - BACnet - A Data Communication Protocol for Building Automation and Control Networks; 2024, with Errata (2025).

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. UL 778 - Standard for Motor-Operated Water Pumps; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - 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. Operation and Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Pump Seals: One for each type and size of pump.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacture, assembly, and field performance of pumps, with minimum three years of documented experience.

PART 2 PRODUCTS

2.01 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 0934, except for integral-VFDs.
   3. Enclosures: Provide unspecified product(s) required to fit motor:

2.02 CIRCULATORS

A. Horizontal shaft, single-stage pump with direct connected, resilient-mount, oil lubricated motor for discharge pressures of up to 125 psi.

B. Casing: Cast iron, with flanged pump connections.

C. Impeller: Non-ferrous keyed to shaft.

D. Bearings: Oil-lubricated bronze sleeve.

E. Shaft: Alloy steel with bronze sleeve, integral thrust collar.

F. Seal: Mechanical seal, 225 degrees F maximum continuous duty temperature.

G. Drive: Flexible coupling.

H. Electrical:
   1. Motor: 1,750 rpm unless indicated otherwise; see Section 23 0513.
   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.

2.03 IN-LINE PUMPS

A. Closed-Coupled, Single-Stage Pump: Vertical pump with radially- or horizontally-split casing and integral controls; rated for discharge pressures up to 175 psi.

B. Casing: Cast iron with seal flush connection, threaded suction, and discharge ports with gauge port and drain plug.

C. Impeller: Bronze, fully enclosed, keyed directly to motor shaft or extension.

D. Shaft: Stainless steel with stainless steel impeller cap screw or nut and stainless steel sleeve.

E. Seal: Mechanical seal, 225 degrees F maximum continuous duty temperature.

F. Electrical:
   1. Motor: 1,750 rpm, open drip-proof (ODP); see Section 23 0513.
   2. Integral Controls:
      a. Variable Frequency Drive (VFD): Factory-fitted and tested with dedicated terminal box for power, instrumentation and related control wiring.
      b. DDC Controller: VFD-integrated or external controller module with visual-tactile interface and minimum of 2 analog inputs, 2 digital inputs, and real-time clock. Provide differential pressure sensor and temperature sensor with thermowell and thermal grease.
      c. BAS, SCADA, or Other Integrated Automation Link: BACnet MS/TP in accordance with ASHRAE Std 135.

2.04 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, total-enclosed, fan-cooled (TEFC); see Section 23 0513.
   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

3.01 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide access space around pumps for service. Provide no less than minimum space recommended by manufacturer.

C. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings. For close-coupled or base-mounted pumps, provide supports under elbows on pump suction and discharge line sizes 4 inches and over.

D. Provide line sized shut-off valve and pump suction fitting on pump suction, and line sized combination pump discharge valve on pump discharge.

E. Provide air cock and drain connection on horizontal pump casings.

F. Provide drains for bases and seals, piped to and discharging into floor drains.

G. Check, align, and certify alignment of base-mounted pumps prior to start-up.

H. Install close-coupled and base-mounted pumps on concrete housekeeping base, with anchor bolts, set and level, and grout in place. See Section 03 3000.

I. Lubricate pumps before start-up.

J. Controls Human-Machine Interface (HMI): HVAC operator terminal; see Section 25 3500.

END OF SECTION

SECTION 23 2300
REFRIGERANT PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping.
B. Refrigerant.
C. Moisture and liquid indicators.
D. Valves.
E. Strainers.
F. Check valves.
G. Pressure regulators.
H. Pressure relief valves.
I. Filter-driers.
J. Solenoid valves.
K. Expansion valves.
L. Receivers.
M. Engineered wall seals and insulation protection.

1.02 RELATED REQUIREMENTS

A. Section 08 3100 - Access Doors and Panels.
B. Section 23 0716 - HVAC Equipment Insulation.

1.03 REFERENCE STANDARDS

A. AHRI 495 - Performance Rating of Refrigerant Liquid Receivers; 2005.
B. AHRI 760 (I-P) - Performance Rating of Solenoid Valves for Use with Volatile Refrigerants; 2014.
C. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2024, with Addendum (2026).
D. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.
E. ASME B31.5 - Refrigeration Piping and Heat Transfer Components; 2022.
F. ASME B31.9 - Building Services Piping; 2025.
G. 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; 2025, with Errata.
H. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service; 2023.
I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.
J. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.
K. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2026.

L. 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).

M. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.

N. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).

O. ASTM G153 - Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials; 2013 (Reapproved 2021).

P. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2019.

Q. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2025.

R. UL 429 - Electrically Operated Valves; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide general assembly of specialties, including manufacturer's catalogue information. Provide manufacturer's catalog data including load capacity.

C. Submit welders certification of compliance with ASME BPVC-IX.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store piping and specialties in shipping containers with labeling in place.

B. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.

C. Dehydrate and charge components such as piping and receivers, seal prior to shipment, until connected into system.

PART 2 PRODUCTS

2.01 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified ensure system components are compatible and joined to ensure integrity of system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

B. Provide pipe hangers and supports in accordance with ASME B31.5 unless indicated otherwise.

C. Liquid Indicators:
1. Use line size liquid indicators in main liquid line leaving condenser.
2. If receiver is provided, install in liquid line leaving receiver.
3. Use line size on leaving side of liquid solenoid valves.

D. Valves:
1. Use service valves on suction and discharge of compressors.
2. Use gauge taps at compressor inlet and outlet.
3. Use gauge taps at hot gas bypass regulators, inlet and outlet.
4. Use check valves on compressor discharge.
5. Use check valves on condenser liquid lines on multiple condenser systems.

E. Refrigerant Charging (Packed Angle) Valve: Use in liquid line between receiver shut-off valve and expansion valve.

F. Strainers:
1. Use line size strainer upstream of each automatic valve.

2. Use shut-off valve on each side of strainer.

G. Filter-Driers:
1. Use a filter-drier immediately ahead of liquid-line controls, such as thermostatic expansion valves, solenoid valves, and moisture indicators.

H. Receivers:
1. Use on systems with long piping runs.

2.02 REGULATORY REQUIREMENTS

A. Comply with ASME B31.9 for installation of piping system.

B. Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.

C. Welders Certification: In accordance with ASME BPVC-IX.

2.03 PIPING

A. Copper Tube: ASTM B280, H58 hard drawn or O60 soft annealed.
1. Fittings: ASME B16.22 wrought copper.
2. Joints: Braze, AWS A5.8M/A5.8 BCuP silver/phosphorus/copper alloy.

B. Pipe Supports and Anchors:
1. Provide hangers and supports that comply with MSS SP-58.
a. 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 2 Inches and Over: Carbon steel, adjustable, clevis.
3. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
4. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
5. Vertical Support: Steel riser clamp.
6. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
7. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
8. 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.

2.04 MOISTURE AND LIQUID INDICATORS

A. Indicators: Single port type, UL listed, with copper or brass body, flared or soldered ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum temperature of 200 degrees F and maximum working pressure of 500 psi.

2.05 VALVES

A. Diaphragm Packless Valves:
1. UL listed, globe or angle pattern, forged brass body and bonnet, phosphor bronze and stainless steel diaphragms, rising stem and handwheel, stainless steel spring, nylon seat disc, soldered or flared ends, with positive backseating; for maximum working pressure of 500 psi and maximum temperature of 275 degrees F.

B. Packed Angle Valves:
1. Forged brass or nickel plated forged steel, forged brass seal caps with copper gasket, rising stem and seat with backseating, molded stem packing, soldered or flared ends; for maximum working pressure of 500 psi and maximum temperature of 275 degrees F.

C. Ball Valves:
1. Two piece bolted forged brass body with teflon ball seals and copper tube extensions, brass bonnet and seal cap, chrome plated ball, stem with neoprene ring stem seals; for maximum working pressure of 500 psi and maximum temperature of 300 degrees F.

D. Service Valves:
   1. Forged brass body with copper stubs, brass caps, removable valve core, integral ball check valve, flared or soldered ends, for maximum pressure of 500 psi.

2.06 STRAINERS

A. Straight Line or Angle Line Type:
   1. Brass or steel shell, steel cap and flange, and replaceable cartridge, with screen of stainless steel wire or monel reinforced with brass; for maximum working pressure of 430 psi.

2.07 CHECK VALVES

A. Globe Type:
   1. Cast bronze or forged brass body, forged brass cap with neoprene seal, brass guide and disc holder, phosphor-bronze or stainless steel spring, teflon seat disc; for maximum temperature of 300 degrees F and maximum working pressure of 425 psi.

2.08 PRESSURE REGULATORS

A. Brass body, stainless steel diaphragm, direct acting, adjustable over 0 to 80 psi range, for maximum working pressure of 450 psi.

2.09 PRESSURE RELIEF VALVES

A. Straight Through or Angle Type: Brass body and disc, neoprene seat, factory sealed and stamped with ASME UV and National Board Certification NB, selected to ASHRAE Std 15, with standard setting of 235 psi.

2.10 FILTER-DRIERS

A. Performance:
   1. Pressure Drop: 2 psi, maximum, when operating at full connected evaporator capacity.
   2. Design Working Pressure: 350 psi, minimum.

B. Cores: Molded or loose-fill molecular sieve desiccant compatible with refrigerant, activated alumina, activated charcoal, and filtration to 40 microns, with secondary filtration to 20 microns; of construction that will not pass into refrigerant lines.

C. Construction: UL listed.
   1. Connections: As specified for applicable pipe type.

2.11 SOLENOID VALVES

A. Valve: AHRI 760 (I-P), pilot operated, copper, brass or steel body and internal parts, synthetic seat, stainless steel stem and plunger assembly (permitting manual operation in case of coil failure), integral strainer, with flared, soldered, or threaded ends; for maximum working pressure of 500 psi.

B. Coil Assembly: UL 429 UL listed, replaceable with molded electromagnetic coil, moisture and fungus proof, with surge protector and color coded lead wires, integral junction box with pilot light.

2.12 ELECTRONIC EXPANSION VALVES

A. Valve:
   1. Brass body with flared or soldered connection, needle valve with floating needle and machined seat, stepper motor drive.

B. Refrigeration System Control: Electronic microprocessor based unit in enclosed case, with proportional integral control of valve, on/off thermostat, air temperature alarm (high and low), solenoid valve control, liquid injection adaptive superheat control, maximum operating pressure function, night setback thermostat, timer for defrost control.

2.13 RECEIVERS

A. Internal Diameter 6 inch and Smaller:
   1. AHRI 495, UL listed, steel, brazed; 400 psi maximum pressure rating, with tappings for inlet, outlet, and pressure relief valve.

2.14 ENGINEERED WALL SEALS AND INSULATION PROTECTION

A. Basis of Design: Airex Manufacturing, Inc; www.airexmfg.com/#sle.
   1. Pipe Penetration Wall Seal: Airex Titan Outlet.
   2. Refrigeration Pipe Insulation Protection System: Airex E-Flex Guard.

B. Pipe Penetration Wall Seal: Seals HVAC piping wall penetrations with compression gasket wall mounted rigid plastic outlet cover.
   1. Outlet Cover Color: As selected by Architect.
   2. Water Penetration: Comply with ASTM E331.
   3. Air Leakage: Comply with ASTM E283/E283M.
   4. Air Permeance: Comply with ASTM E2178.

C. Insulation Protection System: Mechanical line insulation and PVC cover.
   1. PVC Insulation Cover Color: Black with full-length velcro fastener.
   2. Weatherization and Ultraviolet Exposure Protection: Comply with ASTM G153.
   3. Water/Vapor Permeability: Comply with ASTM E96/E96M.
   4. Anti-Fungal and Anti-Microbial Resistance: Comply with ASTM G21.
   5. Flame Spread and Smoke Development Rating of 25/450: Comply with ASTM E84.

PART 3 EXECUTION

3.01 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.

3.02 INSTALLATION

A. Install refrigeration specialties in accordance with manufacturer's instructions.

B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.

C. Install piping to conserve building space and avoid interference with use of space.

D. Group piping whenever practical at common elevations and locations. Slope piping one percent in direction of oil return.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.5.
   2. Support horizontal piping as indicated.
   3. Place hangers within 12 inches of each horizontal elbow.
   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.
   6. Provide copper plated hangers and supports for copper piping.

G. Arrange piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required. Slope horizontal piping 0.40 percent in direction of flow.

H. Provide clearance for installation of insulation and access to valves and fittings.

I. Provide access to concealed valves and fittings. Coordinate size and location of access doors with Section 08 3100.

J. Flood piping system with nitrogen when brazing.

K. Insulate piping.

L. Follow ASHRAE Std 15 procedures for charging and purging of systems and for disposal of refrigerant.

M. Provide replaceable cartridge filter-driers, with isolation valves and valved bypass.

N. Locate expansion valve sensing bulb immediately downstream of evaporator on suction line.

O. Provide external equalizer piping on expansion valves with refrigerant distributor connected to evaporator.

P. Fully charge completed system with refrigerant after testing.

END OF SECTION

SECTION 23 2500
HVAC WATER TREATMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. By-pass (pot) feeder.

1.02 REFERENCE STANDARDS

A. UL (DIR) - Online Certifications Directory; Current Edition.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide chemical treatment materials, chemicals, and equipment including electrical characteristics and connection requirements.

C. Manufacturer's Installation Instructions: Indicate placement of equipment in systems, piping configuration, and connection requirements.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience. Company shall have local representatives with water analysis laboratories and full time service personnel.

PART 2 PRODUCTS

2.01 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.

D. Provide certificate of compliance from Authority Having Jurisdiction indicating approval of installation.

2.02 BY-PASS (POT) FEEDER

A. 2 gal quick opening cap for working pressure of 175 psi.

PART 3 EXECUTION

3.01 PREPARATION

A. Systems shall be operational, filled, started, and vented prior to cleaning. Use water meter to record capacity in each system.

B. Place terminal control valves in open position during cleaning.

C. Verify that electric power is available and of the correct characteristics.

3.02 CLEANING SEQUENCE

A. Concentration:
   1. As recommended by manufacturer.

B. Chilled Water Systems:
   1. Circulate for 48 hours, then drain systems as quickly as possible.
   2. Refill with clean water, circulate for 24 hours, then drain.
   3. Refill with clean water and repeat until system cleaner is removed.

C. Remove, clean, and replace strainer screens.

D. Inspect, remove sludge, and flush low points with clean water after cleaning process is completed. Include disassembly of components as required.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.04 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.

3.05 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.

END OF SECTION

SECTION 23 3100
HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal ducts.

B. Flexible ducts.

C. Nonmetal ducts.

D. Air plenums and casings.

E. Ducts for kitchen exhaust applications.

F. Ducts for laboratory and industrial-grade applications.

1.02 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.

B. Section 09 9113 - Exterior Painting: Weld priming, weather resistant, paint or coating.

C. Section 09 9123 - Interior Painting: Weld priming, paint or coating.

D. Section 11 4000 - Foodservice Equipment: Kitchen range hoods.

E. Section 23 0713 - Duct Insulation: External insulation and duct liner.

F. Section 23 3300 - Air Duct Accessories.

G. Section 23 3319 - Duct Silencers.

H. Section 23 3600 - Air Terminal Units.

I. Section 23 3700 - Air Outlets and Inlets: Fabric air distribution devices.

1.03 REFERENCE STANDARDS

A. ANSI Z9.5 - Laboratory Ventilation; 2022.

B. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

C. ASHRAE Std 126 - Method of Testing HVAC Air Ducts; 2020.

D. ASME AG-1 - Code on Nuclear Air and Gas Treatment; 2023.

E. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.

G. NFPA 45 - Standard on Fire Protection for Laboratories Using Chemicals; 2024.

H. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

I. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2027.

J. NFPA 91 - Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Particulate Solids; 2026.

K. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2027.

L. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

M. SMACNA (KVS) - Kitchen Ventilation Systems and Food Service Equipment Fabrication and Installation Guidelines; 2001.

N. SMACNA (PVC) - Thermoplastic Duct (PVC) Construction Manual; 1995.

O. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; 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.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data for duct materials.

C. Shop Drawings: Shop drawings to be provided prior to start of work for all duct systems. Provide drawings in 1/4" per foot scale or larger.
   1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
   2. Duct layout indicating sizes, configurations, liner material, and static-pressure classes.
   3. Elevation of top and bottom of ducts.
   4. Fittings
   5. Reinforcement and spacing.
   6. Seam and joint construction.
   7. Penetrations through fire-rated and other partitions.
   8. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.

D. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience, and approved by manufacturer.

B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum three years of documented experience.

1.06 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.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Provide UL Class 1 ductwork, fittings, hangers, supports, and appurtenances in accordance with NFPA 90A, NFPA 90B, and SMACNA (DCS) guidelines unless stated otherwise.

B. Perform Work in accordance with SMACNA (DCS).

C. Acoustical Treatment: Provide sound-absorbing liners and sectional silencers for metal-based ducts in compliance with Section 23 3319.

D. Structural Performance: Duct hangers and supports are to withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA (DCS) and ASCE 7.

E. Wind Performance: Ducts are to withstand the effects of wind and tornado loads determined in accordance with ASCE 7.

F. Airstream Surfaces: Surfaces in contact with airstream comply with requirements in ASHRAE 62.1.

G. Duct Shape: Provide round/rectangular duct as indicated on plan.

H. Duct Wall Type: Single wall ductwork is allowed in all concealed applications. For ductwork exposed to view, provide double-wall insulated ductwork.

I. Duct Dimensions: Unless otherwise indicated, all duct dimensions indicated on Drawings are inside clear dimensions and do not include insulation or duct wall thickness. Contractor may alter duct dimensions, provided an equivalent net clear free area is maintained. For rectangular duct, aspect ratio shall be maintain less than 4:1.

J. Duct Materials:
   1. Construct ducts or galvanized sheet steel unless otherwise indicated.
   2. For ducts exposed to weather, construct of Type 304 stainless steel indicated by manufacturer to be suitable for outdoor installation.

K. 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.
   8. All round ductwork, exposed to view, shall be constructed of sprial seam pipe.

2.02 METAL DUCTS

A. Rectangular Metal Duct:
   1. Rectangular Double Wall Insulated: Rectangular 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 1/2 inch.
         2) Material: Fiberglass.
      b. Where noted on plans, provide outer surface with paint grip finish. Coordinate paint color with Architect.

B. 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 1/2 inch.
         2) Material: Fiberglass.

b. Where noted on plans, provide outer surface with paint grip finish. Coordinate paint color with Architect.

3. Round Connection System: Interlocking duct connection system in accordance with SMACNA (DCS).

C. Round Spiral Duct:
1. Round spiral lock seam duct with galvanized steel outer wall.

D. 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. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.
   c. For Use with Flexible Ducts: UL labeled.
4. Gasket Tape:
   a. Provide butyl rubber gasket tape for a flexible seal between transfer duct connector (TDC), transverse duct flange (TDF), applied flange connections, and angle ring connections.
5. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.03 FLEXIBLE DUCTS

A. Flexible Ducts: UL 181, Class 1, polyethylene film, mechanically fastened and rolled using galvanized steel to form spiral helix.
1. Insulation: R6 insulation with aluminized vapor barrier film.
2. Pressure Rating: 10 in-wc positive and 5 in-wc negative.
3. Maximum Velocity: 4000 fpm.
4. Temperature Range: Minus 20 degrees F to 250 degrees F.

2.04 NON-METAL DUCTS

A. Manufacturers:
1. DuctSox Corporation
2. Substitutions: See Section 01 6000 - Product Requirements.

B. Internal Hoop System: Air diffusers shall be constructed with internal retention system consisting of internal 360 degree hoop system, spaced minimum 5' on center installed with a one row suspension system located 1.5" above top-dead-center of the textile system. System shall have hot dipped galvanized or stainless steel construction.

C. External Support:
1. System attachment to external tension cable.
2. Cable suspension hardware to include stainless steel cable, eye bolts, thimbles, cable clamps, and turnbuckle(s) as required.

D. Textile Construction: Filament/filament Twill polyester, treated with a machine washable anti-microbial agent by the fabric manufacturer, fire retardant in accordance with UL 2518. Non-linting filament yarn to meet the requirements of ISO Class 3 Environment.
1. Air Permeability: 2 (+2/-1) CFM/ft² per ASTM D737.
2. Weight: 6.8 oz./yd² per ASTM D3776.

3. Warranty: Fifteen (15) years.
4. Color: Per Architect

E. Textile system to be constructed in modular lenths (zippered) with proper radial securing clips (inlets, endcaps and mid-sections) and top access zippers for vertical cable safety attachment.

F. Integrated air dispersion shall be selected by manufacturer based on best air distribution performance for both cooling and heating modes of operation for specified space of duct installation for variable air volume in cooling and constant air volume in heating.
   1. Linear Vents: Integrated air dispersion shall be specified and approved by manufacturer.
      a. Air dispersion accomplished by linear vent and permeable fabric. Linear vents must be sized in 1 CFM per linear foot increments (based on 0.5" SP), starting at 1 CFM through 90 CFM per linear foot. Linear vent is to consist of an array of open orifices rather than a mesh style vent to reduce maintenance requirements of mesh style vents. Linear vents should also be designed to minimize dusting on fabric surface.
      b. Size of vent openings and location of linear vents to be specified and approved by manufacturer.
   2. Orifices - 2" and 3" Sewn in Grommets:
      a. Air dispersion and extended throws are accomplished by reinforced orifices and permeable fabric. Reinforced orifices are to be installed to keep the integrity of opening and withstand laundry processes.
      b. Diameter, quantity, and location of reinforced orifices to be specified and approved by the manufacturer.
   3. Fixed Nozzles:
      a. Air dispersion accomplished by using conical aerodynamic nozzles and permeable fabric. Diameter of nozzles height to be minimum 1/2". Due to exact requirements of throw and maximum level of noise alternative flow models are not acceptable.
      b. Color of nozzles must match color of fabric.
      c. Location and number of nozzles to be specified and approved by the manufacturer.

G. Inlet connection to metal duct via fabric draw band with anchor patches as supplied by manufacturer. Anchor patches to be secured to metal duct via zip screw fastener - supplied by contractor. Inlet connection shall include zipper for easy removal/maintenance.

H. System to include adjustable flow devices to balance turbulence, airflow and distribution as required.

I. Install system in strict accordance with manufacturer's installation instructions.

2.05 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.

2.06 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: 2 in-wc pressure class stainless steel.
2. Fabricate using single wall, 18-gauge, 0.050-inch Type 304 stainless steel with external welded joints.
3. Seal joints during installation with factory-supplied overlapping V-bands and sealant.

2.07 DUCTS FOR LABORATORY AND INDUSTRIAL-GRADE APPLICATIONS

A. Sectional Shape and Material Requirements:
1. Round Thermoplastic (PVC I) Duct:
   a. Class 5 Air Duct Capacity:
      1) Pressure Class: Minus 10 in-wc.
      2) Maximum Temperature: 100 degrees F.
   b. Protection: Apply ultraviolet protection for segments exposed to direct sunlight.
   c. Compliance: Provide reinforced ductwork, fittings, supports, hangers, and appurtenances in compliance with SMACNA (PVC).

B. Laboratory Exhaust Applications:
1. Dust Collector Exhaust: Round thermoplastic (PVC) ductwork.
2. Fume Hood Cabinet Exhaust:
   a. Minimum 20-gauge, 0.035-inch Type 304 stainless steel, unless noted otherwise.
      1) Fabricate in accordance with ductwork manufacturer's instructions; test duct system to sustain positive and negative pressures in accordance with ASHRAE Std 126 and ASME AG-1.
   b. Provide ductwork and appurtenances in accordance with NFPA 91 requirements except where NFPA 45 applications take precedence.
   c. Coordinate duct, fittings, hangers, and accessories to comply with ANSI Z9.5.
   d. Design, fabricate, and install liquidtight preventing exhaust leakage into the building.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install, support, and seal ducts in accordance with SMACNA (DCS).

B. Comply with safety standards NFPA 90A and NFPA 90B.

C. During construction, provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering the ductwork system.

D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

E. Flexible Ducts: Connect to metal ducts with draw bands.

F. Kitchen Range Hoods: Install when provided by Section 11 4000 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. Provide openings in ductwork as indicated to accommodate thermometers and controllers. Provide pilot tube openings as indicated for testing of systems, complete with metal can with spring device or screw to insure against air leakage. For openings, insulate ductwork and install insulation material inside a metal ring.

J. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

K. Use double nuts and lock washers on threaded rod supports.

L. Connect terminal units to supply ducts directly or with one foot maximum length of flexible duct. Do not use flexible duct to change direction.

M. Connect diffusers or light troffer boots to low-pressure ducts directly or with 5 feet maximum length of flexible duct held in place with strap or clamp.

N. Set plenum doors at 6 to 12 inches above floor. Arrange door swings so that fan static pressure holds door in closed position.

O. At exterior wall louvers, seal duct to louver frame and install blank-out panels.

P. 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.

Q. Fire Partitions: Provide firestopping sealing. See Section 07 8400.

R. Duct Accessories, Terminal Units, Inlets, and Outlets: Interconnect as indicated in Sections 23 3300, 23 3600, and 23 3700.

S. Duct Insulation: Provide duct insulation. See Section 23 0713.

T. Painting: Provide surface finish as indicated on drawings. See Sections 09 9113 and 09 9123.

END OF SECTION

SECTION 23 3300
AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Backdraft dampers - metal.

B. Backdraft dampers - fabric.

C. Combination fire and smoke dampers.

D. Duct access doors.

E. Duct test holes.

F. Fire dampers.

G. Flexible duct connectors.

H. Smoke dampers.

I. Smoke and fire-smoke damper test module.

J. Volume control dampers.

1.02 RELATED REQUIREMENTS

A. Section 23 3100 - HVAC Ducts and Casings.

1.03 REFERENCE STANDARDS

A. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025, with Amendment (2024).

B. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

C. NFPA 92 - Standard for Smoke Control Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2027.

E. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2025.

F. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

G. UL 33 - Safety Heat Responsive Links for Fire-Protection Service; Current Edition, Including All Revisions.

H. UL 555 - Standard for Fire Dampers; Current Edition, Including All Revisions.

I. UL 555C - Standard for Safety Ceiling Dampers; Current Edition, Including All Revisions.

J. UL 555S - Standard for Smoke Dampers; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - 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. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements for additional provisions.
   2. Extra Fusible Links: One of each type and size.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect dampers from damage to operating linkages and blades.

PART 2 PRODUCTS

2.01 TURNING VANES

A. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet metal; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
   1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

B. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."

C. Vane Construction: Single wall for ducts up to 48 inches wide and double wall for larger dimensions.

2.02 BACKDRAFT DAMPERS - METAL

A. Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: Galvanized steel, with center pivoted blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

2.03 BACKDRAFT DAMPERS - FABRIC

A. Fabric Backdraft Dampers: Factory-fabricated.
   1. Blades: Neoprene coated fabric material.
   2. Birdscreen: 1/2 inch nominal mesh of galvanized steel or aluminum.
   3. Maximum Velocity: 1000 fpm (5 mps) face velocity.

2.04 COMBINATION FIRE AND SMOKE DAMPERS

A. Fabricate in accordance with NFPA 90A, UL 555, UL 555S, and as indicated.

B. Provide factory sleeve and collar for each damper.

C. Multiple Blade Dampers: Fabricate with 16 gauge, 0.0598 inch galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, stainless steel jamb seals, 1/8 by 1/2 inch plated steel concealed linkage, stainless steel closure spring, blade stops, and lock, and 1/2 inch actuator shaft.

D. Operators: UL listed and labeled; spring-return, electric-type suitable for 120 volts, single phase, 60 Hz. Provide end switches to indicate damper position. Locate damper operator on exterior of duct and link to damper operating shaft.

E. Normally Closed Smoke Responsive Fire Dampers: Curtain type, opening by gravity upon actuation of electro thermal link, flexible stainless steel blade edge seals to provide constant sealing pressure.

F. Electro Thermal Link: Fusible link melting at 165 degrees F; 120 volts, single phase, 60 Hz; UL listed and labeled.

2.05 DUCT ACCESS DOORS

A. Fabricate in accordance with SMACNA (DCS) and as indicated.

B. Access doors with sheet metal screw fasteners are not acceptable.

2.06 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.

B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.07 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 three hour service in compliance with UL 555C.

C. 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.

D. Fusible Links: UL 33, separate at 160 degrees F with adjustable link straps for combination fire/balancing dampers.

2.08 FLEXIBLE DUCT CONNECTORS

A. Fabricate in accordance with SMACNA (DCS) and as indicated.

B. Flexible Duct Connections: Fabric crimped into metal edging strip.
   1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz/sq yd.
      a. Net Fabric Width: Approximately 2 inches wide.
   2. Metal: 3 inches wide, 24 gauge, 0.0239 inch thick galvanized steel.

C. Leaded Vinyl Sheet: Minimum 0.55 inch thick, 0.87 lbs per sq ft, 10 dB attenuation in 10 to 10,000 Hz range.

D. Maximum Installed Length: 14 inch.

2.09 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 pneumatic actuator.

C. Electro Thermal Link: Fusible link melting at 165 degrees F; 120 volts, single phase, 60 Hz; UL listed and labeled.

2.10 SMOKE AND FIRE-SMOKE DAMPER TEST MODULE

A. Addressable fire alarm system proprietary controller module preconfigured for remote testing of dedicated smoke damper or combination fire-smoke damper.

B. Provide module, accessories, and connectivity to meet NFPA 80 and NFPA 105 requirements.

2.11 VOLUME CONTROL DAMPERS

A. Splitter Dampers:
   1. Material: Same gauge as duct to 24 inches size in either direction, and two gauges heavier for sizes over 24 inches.
   2. Blade: Fabricate of single thickness sheet metal to streamline shape, secured with continuous hinge or rod.

3. Operator: Minimum 1/4 inch diameter rod in self aligning, universal joint action, flanged bushing with set screw.

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. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
   3. Where rod lengths exceed 30 inches provide regulator at both ends.

PART 3 EXECUTION

3.01 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.02 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). See Section 23 3100 for duct construction and pressure class.

B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide for cleaning kitchen exhaust ducts in accordance with NFPA 96 Provide minimum 8 by 8 inch size access door for hand and shoulder access, or as indicated on drawings. Provide minimum 4 by 4 inch size access door for balancing dampers only. Review locations prior to fabrication.

D. Provide duct test holes where indicated and required for testing and balancing purposes.

E. 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.

F. Install smoke dampers and combination smoke and fire dampers in accordance with NFPA 92.

G. Demonstrate re-setting of fire dampers to Owner's representative.

H. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.

I. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.

J. For fans developing static pressures of 5.0 inches and over, cover flexible connections with leaded vinyl sheet, held in place with metal straps.

K. 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.

L. Use splitter dampers only where indicated.

M. 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.

N. Provide 6 inch flourescent colored ribbon on end of balancing damper shaft for visual aide in identifying damper location.

END OF SECTION

SECTION 23 3319
DUCT SILENCERS

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

1.02 REFERENCE STANDARDS

A. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide catalog information indicating, materials, dimensional data, pressure losses, and acoustical performance.

C. Shop Drawings: Indicate assembly, materials, thicknesses, dimensional data, pressure losses, acoustical performance, layout, and connection details.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

PART 2 PRODUCTS

2.01 DUCT SILENCERS

A. Description: Duct section with sheet metal outer casing, sound absorbing fill material, and inner casing of perforated sheet metal; incorporating interior baffles of similar construction. Fabricate in accordance with SMACNA (DCS) HVAC Duct Construction Standards.

B. Geometry:
   1. Rectangular straight with splitters or baffles.
   2. Rectangular elbows with splitters or baffles.

C. Materials:
   1. Outer Casing: Minimum 22 gauge, 0.0299 inch thick galvanized steel stiffened as required, with mastic filled lock formed seams, 2 inch long, 11 gauge, 0.1196 inch slip joints on both ends.
   2. Inner Casing and Splitters: Minimum 24 gauge, 0.0239 thick perforated galvanized steel.
   3. Fill: Glass fiber or mineral wool of minimum 4 lb/cu ft density.
   4. Fill Liner: Bonded glass fiber matting.

END OF SECTION

SECTION 23 3423
HVAC POWER VENTILATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof exhausters.

B. Roof ventilators.

C. Cabinet exhaust fans.

D. Upblast roof exhausters.

E. Inline centrifugal fans and blowers.

F. Kitchen hood upblast roof exhausters.

G. Laboratory-fume exhaust fans.

1.02 RELATED REQUIREMENTS

A. Section 23 3300 - Air Duct Accessories: Backdraft dampers.

B. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.

C. Section 26 2923 - Variable-Frequency Motor Controllers.

1.03 REFERENCE STANDARDS

A. AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program; 2015.

B. AMCA 99 - Standards Handbook; 2025.

C. AMCA 204 - Balance Quality and Vibration Levels for Fans; 2020.

D. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2025.

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 - Reverberation Room Methods of Sound Testing of Fans; 2024.

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; 2027.

M. UL 705 - Power Ventilators; Current Edition, Including All Revisions.

N. UL 762 - Outline of Investigation for Power Roof Ventilators for Restaurant Exhaust Appliances; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - 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. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Fan Belts: One set for each individual fan.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.06 FIELD CONDITIONS

A. Request Owner permission to use permanent ventilator(s) for ventilation during construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Carnes, a division of Carnes Company Inc
B. Greenheck Fan Corporation
C. Loren Cook Company
D. Twin City Fan & Blower
E. Broan.
F. Panasonic
G. Substitutions: See Section 01 6000 - Product Requirements.

2.02 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. UL Compliance: UL 705, listed, labeled, designed, manufactured, and tested.
F. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
G. Kitchen Hood Exhaust Fans: Comply with requirements of NFPA 96 and UL 762.

2.03 ROOF VENTILATORS

A. Fan Unit: V-belt or direct driven as indicated, 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. Disconnect Switch: Factory wired, nonfusible, in housing for thermal overload protected motor and wall mounted multiple speed switch or solid-state speed controller.
C. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked.
D. Sheaves: 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.
E. Performance Ratings: As indicated on drawings.

2.04 CABINET EXHAUST FANS

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. Grille: Aluminum with baked white enamel finish.

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.

2.05 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:
      a. Indoor Clean, Dry Locations: Type 1.
      b. Outdoor Locations: Type 3R.
   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. Drain Trough: Allows for single-point drainage of water, grease, and other residues.

F. Options/Accessories:
   1. Automatic Belt Tensioner: Automatic device that adjusts for correct belt tension for single drives.
   2. Birdscreen:

a. Provide aluminum construction.
b. Protects fan discharge.

3. Dampers: Provide gravity type.
4. Finishes: Standard factory finish.
5. External motor speed controllers for field mounting.

G. Performance Ratings: As indicated on drawings.

2.06 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. Forward Curved Blower:
1. Direct-driven, resiliently mounted motor, heavy-duty ball bearings, galvanized steel housing for indoor or outdoor service, and removable service panels.
2. Operation: As indicated on drawings.
3. Accessories: Provide backdraft damper, external vibration isolator spring, filter section, intake hood with bird screen, and MERV- 8 filters.

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.

2.07 KITCHEN HOOD 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:
      a. Indoor Clean, Dry Locations: Type 1.
      b. Outdoor Locations: Type 3R.
   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. Drain Trough: Allows for single-point drainage of water, grease, and other residues.

F. Options/Accessories:
   1. Automatic Belt Tensioner: Automatic device that adjusts for correct belt tension for single drives.
   2. Birdscreen:
      a. Provide aluminum construction.
      b. Protects fan discharge.
   3. Clean Out Port: Removable grease repellent compression rubber plug allows access for cleaning wheel through windband.
   4. Roof Curb Extension: Vented curb extension where required for compliance with minimum clearances required by NFPA 96.
   5. Drain Connection:
      a. Aluminum construction.
      b. Container allows single-point drainage of grease, water, or other residues.
   6. Finishes: Standard factory finish.
   7. Grease Trap:
      a. Aluminum.
      b. Built-in drain connection.
      c. Container system to collect grease residue.
   8. Hinge Kit:
      a. Aluminum hinges.
      b. Hinges and restraint cables mounted to base sleeve.
      c. Allows fan to tilt away for access to wheel and ductwork for inspection and cleaning.
   9. Heat Baffle: Prevents heat from radiating into motor compartment.

G. Performance Ratings: As indicated on drawings.

2.08 LABORATORY FUME-EXHAUST FANS

A. General Requirements:
   1. Minimum air discharge velocity of 3,000 fpm in compliance with ANSI Z9.5.
   2. Provide fan-assembly manufactured to sustain structural integrity without external guy-wires or supplemental supports at wind speeds up to 125 mph.
   3. Fan performance tested in accordance with AMCA 210, AMCA 260, and AMCA 300.
   4. Fan performance ratings certified in accordance with AMCA 211 and AMCA 311.
   5. Explosion Resistant Construction: Provide fan classified as Spark B with motor and drive-assembly outside of contaminated airstream in compliance with AMCA 99.

B. Application:
   1. Dedicated Fume Hood Exhaust:
      a. Fan Type: Direct-driven, inverter-duty motor and vfd in compliance with Section 26 2923 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.

C. Fan Section Requirements:
1. Impeller:
a. Non-overloading, backward-inclined centrifugal with airfoil blade wheel.
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. Belt-drive Assembly:
a. Belts, pulleys, and keys oversized for a minimum of 150 percent of driven horsepower.
b. Belts: Static-free and oil resistant.
c. Fully machined cast iron type, keyed and securely attached to the wheel and motor shafts.
d. Motor pulley adjustable for final system balancing, readily accessible for maintenance.
5. Housing:
a. Construct of heavy gauge aluminum with standard factory finish.
b. Mounting Base:
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.
6. 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.
7. 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.
8. Fan Inlet Flow Sensor: Provide factory-mounted pitot tube-based differential pressure sensor probe ready for connection into differential pressure-based flow transmitter.
a. Transmitter Housing: Provide NEMA EN 10250, Type 4 enclosure.

D. Disconnect Switch:
1. Factory-mounted in NEMA EN 10250, Type 3R box wired in compliance with Section 26 0583.
2. Switchbox Finish: Manufacturer's standard unless otherwise indicated.

E. Performance Ratings: As indicated on drawings.

2.09 PREFABRICATED ROOF CURBS

A. Furnish prefabricated roof curb designed to mate with the unit and provide support and a water tight installation when installed properly. The roof curb design shall allow field fabricated rectangular exhaust ductwork to be connected directly to the curb. Curb design shall comply with NRCA requirements.
   1. Roof curb height shall be minimum 18 inches.
   2. For sloped roof decks of 1/4 in. per foot or more, fabricate support units to form level top edge for unit mounting.

B. Roof curbs shall be constructed to support and secure unit to meet local windstorm code requirements. Refer to Structural drawings for local design wind speed (V_ult) and Building Exposure Category. Each curb shall include wind restraint brackets to secure each unit to its curb, as well as base flange anchored to roof structure. Refer to Structural Drawings for structure and angle framing being provided for each unit on the roof.

PART 3 EXECUTION

3.01 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.

D. Hung Cabinet Fans:
   1. Install flexible connections between fan and ductwork; see Section 23 3300. Ensure metal bands of connectors are parallel with minimum 1 inch flex between ductwork and fan while running.

E. Provide sheaves required for final air balance.

F. Install backdraft dampers on inlet to roof and wall exhausters.

G. Provide backdraft dampers on outlet from cabinet and ceiling exhauster fans and as indicated.

END OF SECTION

SECTION 23 3600
AIR TERMINAL UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Single-duct terminal units.
   1. Variable-volume units.
B. Hose kits and valves.

1.02 RELATED REQUIREMENTS

A. Section 23 0548 - Vibration and Seismic Controls for HVAC.
B. Section 23 3100 - HVAC Ducts and Casings.

1.03 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. ASTM A492 - Standard Specification for Stainless Steel Rope Wire; 1995 (Reapproved 2019).
E. ASTM A603 - Standard Specification for Metallic-Coated Steel Structural Wire Rope; 2019.
F. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2025.
G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.
H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
I. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
J. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; 2024.
K. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - 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.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

PART 2 PRODUCTS

2.01 SINGLE-DUCT, VARIABLE-VOLUME UNITS

A. 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.

B. Unit Casing:
   1. Minimum 22 gauge, 0.0299 inch galvanized steel.
   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. 1/2 inch thick, coated, fibrous-glass complying with ASTM C1071.
         1) Secure with adhesive.
         2) Coat edges exposed to airstream with NFPA 90A approved sealant.
         3) Cover liner with non-porous foil.
      b. 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.
      c. Liner not to contain pentabrominated diphenyl ether (CAS #32534-81-9) or octabrominated diphenyl ether.

C. 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.

D. 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.

E. Electrical Requirements:
   1. Single-point power connection.
   2. Equipment wiring to comply with requirements of NFPA 70.

F. Control Transformers: Factory supplied and mounted for electric and electronic control applications.

G. Controls:
   1. DDC (Direct-Digital Controls):
      a. Bi-directional Damper Actuator: 24 volt, powered closed, spring return open.
      b. Microprocessor-Based Controller: Air volume controller, pressure-independent with electronic airflow transducers, factory-calibrated maximum and minimum CFMs.
         1) Occupied and unoccupied operating mode.
         2) Remote reset of temperature or CFM set points.
         3) Proportional, plus integral control of room temperature.
         4) Monitoring and adjusting with portable terminal.
      c. Room Sensor:
         1) Compatible with temperature controls specified.

2) Wall-mounted, system powered, with temperature set-point adjustment including connection access for portable operator terminal.

2. Airflow Sensor: Differential pressure airflow device measuring total, static, and wake pressures.
   a. Signal accuracy: Plus/minus five percent throughout terminal operating range.

2.02 HOSE KITS AND VALVES

A. Hoses:
   1. Provide hoses for all units for connection to main water supply and return headers.
   2. Length: 2 feet.
   3. Material: Braided stainless steel rated to minimum 400 psi at 265 degrees F.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that conditions are suitable for installation.

B. Verify that field measurements are as indicated on drawings.

3.02 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 3100.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Provide manufacturer's field representative to test, inspect, instruct, and observe field-assembled components and equipment installation, including connections and to assist in field testing. Report results in writing.
   1. Leak Test:
      a. After installation, fill water coils and test for leaks.
      b. Repair leaks and retest until no leaks exist.
   2. Operational Test:
      a. After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
      b. Test and adjust controls and safeties.
      c. Replace damaged and malfunctioning controls and other equipment.
      d. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION

SECTION 23 3700
AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Supply, Return, and Exhaust Grilles, Registers and Diffusers

B. Fabric air distribution devices.

C. Louvers:

D. Gravity ventilators.

1.02 RELATED REQUIREMENTS

A. Section 09 9123 - Interior Painting: Painting of ducts visible behind outlets and inlets.

1.03 REFERENCE STANDARDS

A. AMCA 511 - Certified Ratings Program Product Rating Manual for Air Control Devices; 2021, with Editorial Revision (2022).

B. AMCA 550 - Test Method for High Velocity Wind Driven Rain Resistant Louvers; 2022.

C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

D. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.

F. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

G. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2027.

H. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

I. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

J. UL 2518 - Standard for Safety Air Dispersion Systems; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

PART 2 PRODUCTS

2.01 SUPPLY, RETURN, AND EXHAUST GRILLES, REGISTERS AND DIFFUSERS

A. Material: As scheduled on the contract drawings.

B. Finish: As selected by Architect

C. Face Size and Style: As scheduled on the contract drawings.

D. Mounting: As scheduled on the contract drawings. Ceiling mounted air devices shall be compatible with the type of ceiling in which they are to be installed. Contractor is responsible for coordinating with the architectural contract drawings to supply the proper air devices and adapting framework for the type of construction at each air device.

E. Accessories: As scheduled on the contract drawings.

2.02 FABRIC AIR DISTRIBUTION DEVICES

A. General Requirements:
   1. Diffuser material to comply with ASTM E84, UL 723, UL 2518, NFPA 90A, and NFPA 90B.
   2. Air Dispersion Method:
      a. Laser Cut Perforations: 0.157-inch to 3-inch diameter laser cut holes. Location, number, and size determined by manufacturer. Mechanical hole punching methods are not acceptable.
   3. Hanger Supports:
      a. Wire Suspension: Cable system includes cable, clamps, tie-down straps, and turnbuckles as required to support fabric ductwork. Mount cable and fabric duct connections in accordance with manufacturer's instructions.
      b. Reinforcing Devices:
         1) Internal arcs, ribs, or spines.
         2) Internal rings.
         3) Tensioning devices.

B. Continuous Diffusers:
   1. Fabric: 100 percent flame retardant polyester treated with an antimicrobial agent from manufacturer.
   2. Shape: Round.
   3. Frame: Provide framing per manufacturer's recommendations.
   4. Dimensions: As indicated on drawings.
   5. Color: To be selected by Architect from manufacturer's standard range.
   6. Damper: Provide volume control per manufacturer's recommendations.

2.03 LOUVERS

A. Manufacturers:
   1. Ruskin Company
   2. Greenheck.
   3. Pottorff
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Type: 6 inch deep frame with drainable brades, heavy channel frame, 1/2 inch square mesh screen over intake or exhaust end.

C. Fabrication: Minimum 12 gauge, 0.1046 inch (2.66 mm) thick extruded aluminum welded assembly, with factory prime coat finish.

D. Color: To be selected by Architect from manufacturer's standard range.

E. Rating: Where louver is shown to be installed in Storm Shelter envelope, louver shall be rated and certified in compliance with ICC 500

F. Mounting: Furnish with mounting accessories and flanges for installation as required per Architectural and Structural installation details.

2.04 GRAVITY VENTILATORS

A. Spun Aluminum Intake and Relief Gravity Ventilator:
   1. General:

a. Provide low silhouette configuration for intake and relief applications with natural gravity or negative pressure system.
b. Performance ratings and factory testing in accordance with AMCA 511 and AMCA 550.
c. Suitable for non-ducted applications.
d. Equipment to bear permanently affixed manufacturer's nameplate listing model and serial number.

2. Hood:
   a. Material: Aluminum.
   b. Internal structure constructed of galvanized steel.
3. Birdscreen:
   a. Fabricate in accordance with ASTM B221 (ASTM B221M).
   b. Construction: 1/2 inch galvanized mesh.
   c. Horizontally mounted across hood intake area.
4. Options/Accessories:
   a. Roof Curbs:
      1) Flat Roofs:
         (a) Welded, straight side curb with flashing flange and wood nailer.
      2) Pitched Roofs: Welded, straight side curb with flashing flange and wood nailer.
   b. Curb Seal: Rubber seal between fan and roof curb.
   c. Dampers:
      1) Type: Gravity.
      2) Factory designed to prevent outside air from entering back into building when fan is off.
      3) Balanced for minimal resistance to flow.
      4) Galvanized frames with pre-punched mounting holes.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Comply with SMACNA (ASMM) for flashing/counter-flashing of roof penetrations and supports for roof curbs and roof mounted equipment.

C. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.

D. Install diffusers to ductwork with air tight connection.

E. Provide balancing dampers on duct take-off to diffusers and grilles and registers, despite whether dampers are specified as part of diffuser, or grille and register assembly.

F. Paint ductwork visible behind air outlets and inlets matte black, see Section 09 9123.

END OF SECTION

SECTION 23 5216
CONDENSING BOILERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General Description

B. Components

C. Boiler trim.

D. Factory installed controls.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

A. ASHRAE Std 135 - BACnet - A Data Communication Protocol for Building Automation and Control Networks; 2024, with Errata (2025).

B. NFPA 54 - National Fuel Gas Code; 2024.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittals procedures.

B. Product Data: Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories for each model indicated.

C. Shop Drawings: Detail equipment assemblies and indicate deimensions, required clearances, and method of field assembly, components, and location and size of each field connection.
   1. Wiring Diagrams: Detail wiring for power, signla, and control systems and differentiate between manufacturer-installed and field-installed wiring.

D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, cleaning procedures, replacement parts list, and maintenance and repair data.

E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum five years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect boilers from damage by leaving factory inspection openings and shipping packaging in place until final installation.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Provide a five year warranty to include coverage for heat exchanger.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Natural Gas, Propane, or Combination Natural Gas/Propane for Indoor Applications:
   1. Hydrotherm
   2. Camus

2.02 GENERAL DESCRIPTION

A. Design: Boilers shall be CSA design certified as a condensing boiler. Boilers shall be designed for a minimum of 5:1 continuous turn down with constant CO2 over the turndown range. The boiler shall operate with natural gas and have a CSA International certified input rating as noted on the drawings, and a thermal efficiency rating up to 99% at minimum input. The boiler shall be symmetrically air-fuel coupled such that changes in combustion air flow or flue flows affect the BTUH input without affecting combustion quality. The boiler will automatically adjust input for altitude and temperature induced changes in air density. The boiler will use a proven pilot interrupted spark ignition system. The boiler shall use a UL approved flame safeguard ignition control system using UV detection flame sensing. The UV detector shall be air cooled to prevent condensate formation and so designed as to prevent misalignment. The design shall provide for silent burner ignition and operation. The boiler shall be down fired counter flow such that formed condensate always moves toward a cooler zone to prevent re-evaporation. An aluminum corrosion resistant condensate drain designed to prevent pooling and accessible condensate trap shall be provided. In some jurisdictions, a means of neutralizing the condensate Ph levels may be required. Boiler shall be able to vent a minimum horizontal distance of 80 equivalent feet with a vent diameter equivalent to the combustion chamber outlet diameter.

B. Service Access: The boilers shall be provided with access covers for easily accessing all serviceable components. The boilers shall not be manufactured with large enclosures, which are difficult to remove and reinstall. All accesses must seal completely as not to disrupt the sealed combustion process. All components must be accessible and able to adjust with the removal of a single cover or cabinet component.

C. Indicating lights: Each boiler shall include a diagnostic control panel with a full text display indicating the condition of all interlocks and the BTUH input percentage. Access to the controls shall be through a completely removable cover leaving diagnostic panel intact and not disrupted.

2.03 COMPONENTS

A. Combustion Chamber: The combustion chamber shall be constructed of cast-iron. It shall be a down-fired design utilizing lightweight refractory around the burner housing.

B. Heat Exchanger: Boilers shall be a cast iron sectional unit designed for pressure firing and shall be constructed and tested for 100 P.S.I water working pressure, in accordance with the A.S.M.E. Section IV Rules for the Construction of Heating Boilers. Individual sections will have been subjected to a hydrostatic pressure test of 250 PSIG at the factory before shipment and they shall be marked, stamped or cast with the A.S.M.E. Code symbol. Boilers with less than 250-psi pressure test will not be acceptable for this project. The sections shall be of a down fired counter flow single-pass design. Water ports will be sealed with steel push nipple connectors. The sections will be fully machined for metal to metal sealing of the gas side surfaces. The design will provide for equal temperature rise through all sections. The iron shall have a minimum thickness of ¼". The heat exchanger design should have no limitations on temperature rise or restrictions to inlet water temperature.

C. Gas Burner: The burner shall be metal fiber mesh construction, allowing high turndown of the fuel-air mixture. The burner flame shall burn horizontally and be of the pre-mix type with a forced draft fan. Burner shall fire to provide equal distribution of heat throughout the entire heat exchanger. The burner shall be easily removed for maintenance without the disruption of any other major component of the boiler. A window view port shall be provided for visual inspection of the boiler during firing. The gas distribution components and burner shall be enclosed with a cast-aluminum housing.

D. Ignition components: The ignition hardware shall consist of Alumina ceramic insulated ignition electrodes and UV sensing tube permanently arranged to ensure proper ignition electrode and UV alignment.

E. Rated Capacity: The boiler shall be capable of operating at rated capacity with pressures as low as 2" W.C. at the inlet to the burner gas valve.

F. The burner shall be capable of 99% efficiency without exceeding a NOx reading above 11ppm.

G. The burner and gas train shall be provided with the following trim and features:
   1. Burner Firing: Full modulation with 5:1 turndown @ Continuous CO2
   2. Burner Ignition: Intermittent spark
   3. Safety Controls: Energize ignition, limit time for establishing flame, prevent opening of gas valve until pilot flame is proven, stop gas flow on ignition failure, and allow gas valve to open.
   4. Flue-Gas Collector: Enclosed combustion chamber with integral combustion-air blower and single venting connection.
   5. Gas Train: Manual ball type gas valves (2), main gas valve (solenoid), manual test and check valves, pilot gas pressure regulator, and automatic pilot gas valve. All components to be factory mounted and CSD-1 compliant.
   6. Safety Devices: Low gas pressure switch, air-flow switch, and blocked flue detection switch, low water cutoff (manual reset), high temperature manual reset. All safeties to be factory mounted.

2.04 BOILER TRIM

A. ASME rated pressure relief valve.

B. Flow switch.

C. Electronic Low Water Cut-off: Complete with test light and manual reset button to automatically prevent firing operation whenever boiler water falls below safe level.

D. Temperature and pressure gauge.

E. Pressure Switches:
   1. High gas pressure.
   2. Low gas pressure.
   3. Air pressure.

F. Manual reset high limit.

G. Stainless Steel Condensate Receiver Pan

H. Blocked Flue Detection Switch

I. Air Inlet Filter

J. Boiler Pump (where required by boiler design):
   1. Primary pump, factory supplied and sized for field installation to ensure minimum, continuous circulation through boiler.
   2. Where pump is not provided by boiler manufacturer, provide pump in accordance with boiler manufacturer's recommendations.
   3. Pump time delay.

2.05 FACTORY INSTALLED CONTROLS

A. Option for internal or external (0-10) VDC control.

B. Temperature Controls:
   1. Automatic reset type to control fuel burning system on-off and firing rate to maintain temperature.

2. Manual reset type to control fuel burning system to prevent boiler water temperature from exceeding safe system water temperature.
3. Low-fire start time delay relay.

C. Electronic PI setpoint/modulation control system.

D. Microprocessor-based, fuel/air mixing controls.

E. BAS, SCADA, or other Integrated Automation Link: ASHRAE Std 135 BACnet MS/TP.
1. 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.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install boiler and provide connection of natural gas service in accordance with requirements of NFPA 54 and applicable codes.

C. Install boiler on concrete housekeeping base, sized minimum of 4 inches larger than boiler base in accordance with Section 03 3000.

D. Connect hot water piping to supply and return boiler tappings with shutoff valve and union or flange at each connection.

E. Pipe relief valves to nearest floor drain.

F. Connect breeching to boiler outlet, full size of outlet. The boiler shall operate under positive (Category IV) or negative (Category II) stack pressure. Vent material must be listed AL29-4C Stainless Double Wall Stack for condensing appliances.

G. Pipe cooled condensate produced by the combustion process from the boiler condensate connection and/or flue stack with suitable piping material to neutralizer prior to discharging into nearest floor drain.

H. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

END OF SECTION

SECTION 23 6426
ROTARY-SCREW WATER CHILLERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air-cooled rotary-screw chiller.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete housekeeping pads.

B. Section 23 0593 - Testing, Adjusting, and Balancing for HVAC.

C. Section 23 0800 - Commissioning of HVAC.

D. Section 23 0923 - Direct-Digital Control System for HVAC.

E. Section 23 0993 - Sequence of Operations for HVAC Controls.

F. Section 23 2113 - Hydronic Piping.

G. Section 23 2114 - Hydronic Specialties.

H. Section 25 1500 - Integrated Automation Software.

I. Section 25 3519 - Integrated Automation Control Valves.

J. Section 26 0583 - Wiring Connections.

1.03 REFERENCE STANDARDS

A. AHRI 550/590 (I-P) - Standard for 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; 2024, with Addendum (2026).

C. 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.

D. ASHRAE Std 135 - BACnet - A Data Communication Protocol for Building Automation and Control Networks; 2024, with Errata (2025).

E. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1: Rules for Construction of Pressure Vessels; 2025, with Errata .

F. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus; 2026.

G. UL 984 - Hermetic Refrigerant Motor-Compressors; Current Edition, Including All Revisions.

H. UL 1995 - Heating and Cooling Equipment; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - 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 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.

E. Operation and Maintenance Data: Include start-up instructions, maintenance data, parts lists, controls, and accessories; include trouble-shooting guide.

F. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.06 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.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer's Warranty: Provide minimum five year warranty to include coverage for materials only for compressor.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Base Bid: Trane.

B. Alternate 1A: Carrier

C. Alternate 1B: JCI/York

2.02 AIR-COOLED, ROTARY-SCREW, WATER CHILLER CONSTRUCTION REQUIREMENTS

A. Factory assembled and tested chiller consisting of compressor(s), compressor motor(s), motor starter(s) or variable frequency drives as indicated, evaporator, condenser, enclosure, refrigeration circuits(s) and specialties, interconnecting piping, microprocessor-based controls, readouts, and diagnostics.
   1. Rating: AHRI 550/590 (I-P).
   2. Safety: ASHRAE Std 15 and UL 1995.
   3. Construction and Testing: ASME BPVC-VIII-1.
   4. Energy Efficiency: ASHRAE Std 90.1.
   5. Enclosures:
      a. Structural Framing: Mount structural steel on welded steel base with hot-dip galvanized finish.
      b. Steel Cabinet:
         1) Factory apply baked on powder paint or corrosion resistant paint prior to assembly.
         2) Provide gasketing and weatherproofing to panels with fully opening doors containing starters or variable frequency drives, terminal blocks, through-the-door type disconnects and circuit breaker with lockable handles indicating "power-on" or "power-off".
         3) Provide door stays.
      c. Perform 500-hour salt spray test in accordance with ASTM B117 for outdoor applications.

B. Rotary-Screw Compressors:
   1. Unit: Semi-hermetic type with two, variable speed drive compressors with multiple independent refrigeration circuit(s), internal muffler, discharge, check, and suction service valves.

2. Oil Lubrication System: Positive pressure system, oil heater, oil separator, check valves, solenoid valves, and filtration devices.
3. Valves: Check valves in compressor discharge.
4. Capacity Reduction System: Load/unload valve control down to 20 percent of full load without the activation of hot gas bypass.
5. Motors: UL 984, 3,600 rpm, suction gas-cooled, hermetically sealed, squirrel cage induction with starter.

C. Evaporator, Shell and Tube Type:
1. ASME BPVC-VIII-1, two pass type, with two independent refrigeration circuits.
2. Shell, Removable Heads and Tube Support Sheets: Carbon steel.
3. Tubes: Mechanically treated copper tubes fixed and aligned into intermediate tube support sheets across the shell to maintain consistent spacing between tubes with the capability of being cleanable.
4. Working Pressure Rating, Refrigerant-Side: 200 psi.
5. Working Pressure Rating, Water-Side: 150 psi.
6. Cold Surface Insulation:
   a. Factory install on shell and all other cold surfaces.
   b. 0.75-inch minimum thickness, closed cell, expanded polyvinyl chloride flexible foam insulation with a maximum K factor of 0.28.

D. Provide vents and water drain connections.

E. Provide fittings for temperature control sensors.

F. Freeze Protection: Provide evaporator heater with thermostat to protect from freezing at ambient temperatures down to minus 20 degrees F.

G. Air-Cooled Condenser:
1. Heat Exchanger:
   a. Arrangement: Two pass, round tubes.
   b. Mechanically bond aluminum fins to internally enhanced, seamless copper tubing and protect with corrosion resistant materials or coatings.
   c. Clean, dehydrate and test.
   d. Leak Test: 506 psi.
   e. Seal: Nitrogen holding charge.
2. Coil Guards: Provide expanded metal with lint screens. Protect condenser coil by enclosing with heavy plastic to prevent damage during shipping or rigging.
3. Fans and Motors:
   a. Dynamically balanced propeller type, direct drive fans of reinforced polymer corrosion resistant construction and equip with sealed, permanently lubricated ball bearings.
   b. Discharge Fan Guards: Coated steel wire.
   c. Discharge Direction: Vertical.
   d. Motors: Totally enclosed, high efficiency, suitable for outdoor use, three phase, permanent split capacitor, single speed with internal overload protection.

H. Refrigeration Circuits:
1. Provide two independent refrigeration circuit(s) with two compressor(s) per circuit.
2. Minimum Refrigerant Specialties per Circuit:
   a. Isolation and service valves for refrigerant removal and charging.
   b. Removable-core filter driers.
   c. ASHRAE Std 15 compliant relief valves.
   d. Liquid line sight glass with moisture indicator.
   e. Refrigerant expansion valves or metering devices.
   f. Complete operating charge of both refrigerant and oil.

I. 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 3519.
   2. Control Components for Preventing Shutdown:
      a. Provide high pressure limit with indicating light for each compressor, set lower than factory pressure switch to automatically unload compressor and prevent nuisance high pressure condenser control trip.
      b. Provide one protector with indicating light for each compressor, with current limit setpoint of 120 percent of compressor running load amperage to automatically unload compressor preventing over-current trip.
      c. Provide low refrigerant limit to automatically unload each compressor preventing a low evaporator temperature trip.
   3. Chiller Operation in Abnormal Operating Conditions:
      a. Unloaded Running: Adequate chilled water production.
      b. Trip-out Limit Reached: Chiller goes off-line and manual reset is required for continued operation.
   4. Control Panel Display:
      a. Evaporator pressure.
      b. Condenser refrigerant pressure.
      c. Entering and leaving evaporator water temperature.
   5. Points for Remote Monitoring and Control:
      a. Entering and leaving condenser water temperature as applicable.
      b. Chilled water setpoint.
      c. Electrical 3 phase current limit and percent RLA setpoint.
      d. Electrical 3 phase amp draw.
      e. Chiller operating mode.
      f. Condenser refrigerant temperature.
      g. Elapsed time and number of starts counter.
      h. Chiller compressor run status relay.
      i. Minimum of 20 diagnostics with time and date stamp.
      j. Identification of the fault, date, time and operating mode at time of occurrence, type of reset required, and help message.
      k. Relay output energized upon detecting a fault requiring manual reset.
      l. Relay output energized whenever unit is operating in a limit mode for an extended period of time.
      m. Analog input to control leaving chilled water temperature setpoint based upon a 4-20ma or 0-10 VDC signal from the building automation system.

n. Programmable soft during pull-down period via ramped current limit or fully adjustable, temperature pull-down rate.
o. Leaving chilled water reset based upon return water temperature.
p. Provide RS-232 for printer interface.

PART 3 EXECUTION

3.01 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.

G. Coordinate BAS, BMS, or Integrated Automation linking between unit controller(s) and remote front-end interface; see Section 25 1500.

3.02 MANUFACTURER'S FIELD SERVICES

A. Perform factory startup of the chiller by factory trained and authorized servicing technicians confirming equipment has been correctly installed prior to equipment becoming operational and covered under the manufacturer's warranty.

B. Supply initial charge of refrigerant and oil if not completely factory charged.

C. Demonstrate system operations and verify specified performance.

3.03 CLOSEOUT ACTIVITIES

A. Demonstrate proper operation of equipment to Owner's designated representative.

END OF SECTION

SECTION 23 7313
MODULAR CENTRAL-STATION AIR-HANDLING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Casing construction.

B. Fan section.

C. Coil section.

D. Filter and air cleaner section.

E. Damper section.

F. Access section.

G. Controls.

1.02 RELATED REQUIREMENTS

A. Section 23 0548 - Vibration and Seismic Controls for HVAC.

B. Section 23 3413 - Axial HVAC Fans.

C. Section 25 1500 - Integrated Automation Software.

1.03 REFERENCE STANDARDS

A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings; 2015 (Reaffirmed 2026).

B. AHRI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils; 2001, with Addenda (2011).

C. AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program; 2015.

D. AMCA 99 - Standards Handbook; 2025.

E. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2025.

F. AMCA 300 - Reverberation Room Methods of Sound Testing of Fans; 2024.

G. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; 2022.

H. AMCA 500-D - Laboratory Methods of Testing Dampers for Rating; 2018.

I. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; 2023.

J. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size; 2025.

K. ASHRAE Std 62.1 - Ventilation for Acceptable Indoor Air Quality; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

L. 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.

M. ASHRAE Std 135 - BACnet - A Data Communication Protocol for Building Automation and Control Networks; 2024, with Errata (2025).

N. ASTM B177/B177M - Standard Guide for Engineering Chromium Electroplating; 2011 (Reapproved 2021).

O. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

P. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

Q. UL 508 - Industrial Control Equipment; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - 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.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.06 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.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Base Bid: Trane.

B. Alternate 2A: Carrier

C. Alternate 2B: JCI/York

2.02 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. Construct of one piece, insulated, double wall panels.
   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.

C. Access Doors:
1. Construction, thermal and air pressure performance same as casing.
2. Provide surface mounted handles on hinged, swing doors.

D. Outside Air and Exhaust Air Weather Hood:
1. Fabricate from same material as casing outer panel.
2. Extend hood past perimeter of unit casing opening so as not to instruct airflow path.
3. Paint hoods with same finish as external surface of outdoor units.
4. Provide inlet hood for each fresh air damper with a sine wave moisture eliminator to prevent entrainment of water into the unit from outside air.
5. Provide exhaust hoods for each exhaust air opening.
6. Size each hood for 100 percent of nominal fresh air damper capacities.
7. Protect each hood with bird screen to prevent nesting at intake or exhaust airflow paths.

E. Unit Flooring: Construct with sufficient strength to support expected people and equipment loads associated with maintenance activities.

F. Casing Leakage: Seal joints and provide airtight access doors so that air leakage does not exceed one percent of design flow at the specified casing pressure.

G. Insulation:
1. 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.

H. Drain Pan Construction:
1. Provide cooling coil and humidifier sections with an insulated, double wall, galvanized 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.

I. Louvers: Stationary, of galvanized steel, 4 inches deep with plenum, nylon bearings, 1/2-inch mesh, 0.04-inch galvanized wire bird screen in aluminum frame, and bearing AMCA Certified Ratings Seal in accordance with AMCA 500-L. Furnish adjustable louvers with hollow vinyl bulb edging on blades and foam side stops to limit leakage to maximum 2 percent at 4 in-wc differential pressure when sized for 2000 fpm face velocity.

J. Finish:
1. Outdoor Units:
a. Coat external surface of unit casing with primer and minimum 1.5 mil, enamel paint finish.
b. Comply with salt spray test in accordance with ASTM B177/B177M.
c. Color: Manufacturer's standard color.
2. Indoor Units:
a. Provide exterior, galvanized steel panels with painted surface complying with ASTM B177/B177M.
b. Color: Manufacturer's standard color.

2.03 FAN SECTION

A. Type: Forward curved, single width, single inlet, centrifugal plug fan, in accordance with AMCA 99. See Section 23 3413

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. See Section 23 0548.

F. External Motor Junction Box: Factory mount NEMA 4 external junction box and connect to extended motor leads from internally mounted motors.

G. Motor Wiring Conduit: Factory wire fan motor wiring to the unit mounted starter-disconnect, variable frequency drive, and external motor junction box.

H. Flexible Duct Connections:
   1. For separating fan, coil, and adjacent sections.

I. Drives:
   1. Comply with AMCA 99.
   2. Bearings: Heavy duty pillow block type, ball bearings, with ABMA STD 9 L-10 life at 50,000 hours.
   3. Shafts: Solid, hot rolled steel, ground and polished, with key-way, and protectively coated with lubricating oil.
   4. V-Belt Drive: Cast iron or steel sheaves, dynamically balanced, bored to fit shafts, and keyed. Variable and adjustable pitch sheaves for motors 15 hp and under selected so required rpm is obtained with sheaves set at mid-position; fixed sheave for 20 hp and over, matched belts, and drive rated as recommended by manufacturer or minimum 1.5 times nameplate rating of the motor.
   5. Belt Guard: Fabricate to SMACNA (DCS); 0.106 inch thick, 3/4 inch diamond mesh wire screen welded to steel angle frame or equivalent, prime coated. Secure to fan or fan supports without short circuiting vibration isolation, with provision for adjustment of belt tension, lubrication, and use of tachometer with guard in place.

2.04 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 galvanized 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: 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.

2.05 HOSE KITS AND VALVES

A. Hoses:
1. Provide hoses for all units for connection to main water supply and return headers.
2. Length: 2 feet.
3. Material: Braided stainless steel rated to minimum 400 psi at 265 degrees F.

2.06 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. Pleated Media Filters:
1. Media: 2 inch, 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.
2. Frame: Steel wire grid.
3. Minimum Efficiency Reporting Value: MERV 8 when tested in accordance with ASHRAE Std 52.2.

C. 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.

2.07 DAMPER SECTION

A. Mixing Section: Provide a functional section to support the damper assembly for modulating the volume of outdoor and return air.

B. Damper Blades:
1. Double-skin airfoil design with metal, compressible jamb seals and extruded-vinyl blade-edge seals on each blade.
2. Self-lubricating stainless steel or synthetic sleeve bearings.
3. Comply with ASHRAE Std 90.1 I-P for rated maximum leakage rate.
4. Provide leakage testing and pressure ratings in compliance with AMCA 500-D test methods.
5. Arrange in parallel or opposed-blade configuration.

C. Barometric Relief Dampers:
1. Frame: Roll formed galvanized steel.
2. Blades: Roll formed galvanized steel.
3. Blade Seals: Extruded vinyl, mechanically attached to the blade edge.

2.08 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.

2.09 CONTROLS

A. Combination VFD - Disconnects:
   1. Provide factory mounted, combination VFD - disconnect for each fan motor.
   2. Factory mount in full metal enclosure and wire to fan motor.
   3. Mount VFD-disconnect on fan section externally in a NEMA 1 enclosure within a dedicated controls section or housed fan section.
      a. Internal Enclosure Construction Characteristics:
         1) Integral part of unit casing to allow for thermal venting to casing interior.
         2) Accessible from unit exterior via access door.
         3) Construction of access doors same throughout unit.
   4. Include control transformer with sufficient capacity to support the following items:
      a. VFD and controls.
      b. Binary output on-off wiring.
      c. Analog output speed-signal wiring.
      d. Wires that interface between VFD and direct digital controller.

B. DDC Contractor Installed Direct Digital Control (DDC) System:
   1. Mixing Section Dampers:
      a. Outdoor Air Damper: Fail closed using spring-return actuator.
      b. Return Air Damper: Fail open using spring-return actuator.
   2. Temperature Sensors: Provide for fan discharge, supply, return, mixed air, and coil section. Use averaging type for coil sections.
   3. Low Limit Switches:
      a. Factory wire to momentary push-button reset circuit.
      b. Provide separate low limit for each coil in a coil stack.
   4. Fan Status: Provide pressure switch to determine running status.
   5. Loaded Filter Section: Tube to filter section to indicate sectional filter status.
   6. Condensate Overflow Switches:
      a. Comply with UL 508; shut down unit in the event of primary drain blockage.
      b. Factory install float switch in drain pan to detect high water condensate level.
      c. Locate float switch above primary drain line connection and below drain pan rim.
   7. Relays, Unit-Mounted, Output-Linked: Provide for external loads including motor starters, relief dampers, pumps, condensing units, and other equipment as specified in the drawings.

C. BAS, SCADA, or other Integrated Automation Link: ASHRAE Std 135 BACnet MS/TP.

D. 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.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Bolt sections together with gaskets.

C. Isolate fan section with flexible duct connections.

D. 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.

E. Provide fixed sheaves required for final air balance.

F. Make connections to coils with unions or flanges.

G. 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.

H. Cooling Coils:
   1. Pipe drain and overflow to nearest floor drain.

I. Coordinate BAS, BMS, or Integrated Automation linking between unit controller(s) and remote front-end interface; see Section 25 1500.

3.02 SYSTEM STARTUP

A. Provide manufacturer's field representative to perform systems startup.

B. Prepare and start equipment and systems in accordance with manufacturers' instructions and recommendations.

3.03 CLOSEOUT ACTIVITIES

A. Demonstrate proper operation of equipment to Owner's designated representative.

END OF SECTION

SECTION 23 7433
DEDICATED OUTDOOR AIR UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof-mounted DOAS.

1.02 RELATED REQUIREMENTS

A. Section 23 0923 - Direct-Digital Control System for HVAC.

B. Section 23 3300 - Air Duct Accessories: Flexible duct connections.

1.03 REFERENCE STANDARDS

A. AHRI 210/240 - Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2026.

B. AHRI 270 (SI/I-P) - Sound Performance Rating of Outdoor Unitary Equipment; 2025.

C. AHRI 520 - Performance Rating of Positive Displacement Condensing Units; 2004.

D. ASHRAE Std 23 - Methods for Performance Testing Positive Displacement Refrigerant Compressors and Compressor Units; 2022.

E. 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.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

H. UL (DIR) - Online Certifications Directory; Current Edition.

I. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data with dimensions, duct and service connections, accessories, controls, electrical nameplate data, and wiring diagrams.

C. Shop Drawings: Indicate dimensions, duct and service connections, accessories, controls, electrical nameplate data, and wiring diagrams.

D. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Provide five year manufacturers warranty for compressor/condenser unit.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. CaptiveAire Systems

B. Greenheck
C. Aaon.
D. Daikin
E. Trane
F. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ROOF-MOUNTED DOAS

1. Casing and Components:
   a. Fabrication: AHRI 210/240 and UL 207 construction, ASHRAE Std 23 tested.
   b. 18 gauge, 0.0478 inch steel panels reinforced with structural angles and channels to ensure rigidity.
   c. Provide bolted access panels to access each sections from either side of unit.
   d. Provide hinged door with lockable handle for serviceable sections.
   e. Drain Pan: Galvanized steel with corrosion-resistant coating.
2. Performance Ratings: ASHRAE Std 90.1, EER and COP as applicable.
3. Regulatory Requirements: AHRI 270 (SI/I-P) rated, NFPA 70, and UL (DIR) listed.
4. Insulation: Minimum 1 inch thick acoustic duct liner for lining cabinet interior.
5. External Surface Finish: Heat resistant baked enamel.
   a. Set outdoor air dampers to fully open when fan starts and close 30 seconds after fan stops, adjustable.
6. Filter: Removable, 2 inches thick MERV-13.
7. Monitoring: Provide gauge with loaded setpoint-adjustable signal flag or external tag. Provide loaded filter alarm switch wired into unit controls with illuminated indicator on local control panel face.

B. Heating Section:
1. Indirect Gas-Fired Furnace:
   a. Fully sealed natural gas burning assembly configured for modulated 10:1 turn down ratio using electrically operated devices including modulating main gas valve, shut down valve, main gas, and pilot gas regulators. Manual main gas shut-off valve and pilot adjustment valve.
   b. Insulation: Neoprene faced glass fiber insulation, 1 inch thick, on inlet components to burner profile plate.
   c. Observation Port: On burner section for observing main and pilot flames.
   d. Pilot: Electrically ignited by spark rod through high voltage ignition transformer.
   e. Damper: Motorized with end switch to prove position before burner will fire.
   f. Tube Construction: Stainless Steel

C. Cooling Section:
1. Packaged DX Cooling:
   a. Configuration: AHRI 520 rated, R-32 or R-454B refrigerant system with hot gas bypass.
   b. Evaporator Coil: Copper tube aluminum fin coil assembly with alternate row circuiting, and with stainless steel drain pan and electronic expansion valve.
   c. Compressor: Inverter-duty hermetic scroll, 3,600 rpm maximum resilience with positive lubrication, crankcase heater, high pressure control, low pressure control, motor overload protection, service valves and dryer.
   d. Condenser Side: Aluminum fin and copper tube coil, direct drive axial fan resiliently mounted, galvanized fan guard. ECM condenser fans.
   e. Operating and Safety Controls: Internally coordinated with main unit controls.

f. Hot Gas Reheat: Fully modulating hot gas reheat coil of aluminum micro channel design of sufficient capacity to allow for a 20°F temperature rise at all operating conditions.

D. Unit Controls:
1. DDC:
a. Application Specific Controller; see Section 23 0923 unless factory-provided.
b. Tested to monitor and handle sequencing functions and other operational modes using field-mounted thermostat and other sensors.
c. Coordination and Sequencing:
1) Internal Devices: Include compressors, blower, sensors, switches, valves, safeties, other components.
2) Field-Installed Devices: Solenoid valves, thermostat, EWT sensors, LWT sensors, internal and remote contacts, and other devices required for operation.
3) Safeties: At minimum include anti-short-cycle compressor protection, condensate overflow, refrigerant high pressure, refrigerant low pressure, loss-of-charge, refrigerant freeze protection, and freezestat.
2. Interlocked Functions:
a. Unit to start when exhaust fan is running.
b. Low and High Limit Controls: Maintain supply air temperature between set points and shut fan down if temperatures are exceeded. Include manual reset switch.
c. Burner Safety Controls:
1) Sense correct airflow before energizing pilot and sense pilot ignition before activating main gas valve.
2) Burner to operate when flow switch located in exhaust duct proves flow. Exhaust fan speed control with inlet damper and burner profile damper to provide dual volume air capacity.
3) Purge Period Timer: Automatically delays burner ignition and bypass low limit control.
4) Fan Discharge Thermostat: Controls modulating gas valve to maintain supply air temperature.
(a) Provide remote discharge thermostat adjustment within 20 feet of unit.

2.03 PREFRABRICATED ROOF CURBS

A. Furnish prefabricated roof curb designed to mate with the unit and provide support and a water tight installation when installed properly. The roof curb design shall allow field fabricated rectangular supply/return ductwork to be connected directly to the curb. Curb design shall comply with NRCA requirements.
1. Roof curb height shall be minimum 18 inches.
2. For sloped roof decks of 1/4 in. per foot or more, fabricate support units to form level top edge for unit mounting.

B. Roof curbs shall be constructed to support and secure unit to meet local windstorm code requirements. Refer to Structural drawings for local design wind speed (V_ult) and Building Exposure Category. Each curb shall include wind restraint brackets to secure each unit to its curb, as well as base flange anchored to roof structure. Refer to Structural Drawings for structure and angle framing being provided for each unit on the roof.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide unit- or duct-mounted smoke detectors and other NFPA 90A provisions.

C. Follow NFPA 54 guidelines to provide natural gas system connection.

D. Install unit on vibration isolator pad or roof curb..

E. Provide flexible duct connections on inlet and outlet from unit; see Section 23 3300.

F. Connect drain pan outlet to nearest building drain system piping.

G. Provide condensate drain pan overflow switch in primary/auxiliary drain pan, as applicable, for automatic shut down of equipment if primary drain was to malfunction and cause condensate overflow.

H. Adjusting: Use plenum static pressure readings against manufacturer calibration chart to adjust primary airflow as other measuring methods will not work.

I. Coordinate BAS, BMS, or Integrated Automation linking between unit controller(s) and remote front end interface.

END OF SECTION

SECTION 23 8126.13
SMALL-CAPACITY SPLIT-SYSTEM AIR CONDITIONERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air-source heat pumps.

B. Air cooled condensing units.

C. Indoor air handling (fan and coil) units for ductless systems.

D. Controls.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. AHRI 210/240 - Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2026.

B. AHRI 520 - Performance Rating of Positive Displacement Condensing Units; 2004.

C. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2024, with Addendum (2026).

D. ASHRAE Std 23 - Methods for Performance Testing Positive Displacement Refrigerant Compressors and Compressor Units; 2022.

E. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

F. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2027.

G. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.

C. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

PART 2 PRODUCTS

2.01 SYSTEM DESIGN

A. Split-System Heating and Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.
   1. Heating and Cooling: Air-source electric heat pump located in outdoor unit with evaporator.
   2. Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line.

B. Performance Requirements: See Drawings for additional requirements.

C. Certifications:
   1. UL 1995 or UL/CSA 60335-2-40
   2. UL 207

2.02 INDOOR AIR HANDLING UNITS FOR DUCTLESS SYSTEMS

A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, evaporator coil, and controls; wired for single power connection with control transformer.

B. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
   1. Construction and Ratings: In accordance with AHRI 210/240 and UL 207.
   2. Manufacturer: System manufacturer.

2.03 OUTDOOR UNITS

A. Outdoor Units: Self-contained, packaged, pre-wired unit consisting of cabinet, with compressor and condenser.
   1. Comply with AHRI 210/240.
   2. Refrigerant: R-32 or R-454B.
   3. Cabinet: Galvanized steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.
   4. Construction and Ratings: In accordance with AHRI 210/240 with testing in accordance with ASHRAE Std 23 and UL 207.

B. Compressor: Hermetic, two speed 1800 and 3600 rpm, AHRI 520 resiliently mounted integral with condenser, with positive lubrication, crankcase heater, high-pressure control, motor overload protection, service valves and drier. Provide time delay control to prevent short cycling and rapid speed changes.

C. Air Cooled Condenser: Aluminum fin and copper tube coil, AHRI 520 with direct drive axial propeller fan resiliently mounted, galvanized fan guard.

D. Coil: Air-cooled, aluminum fins bonded to copper tubes.
   1. Provide with hail guards to protect coil.

E. Operating Controls:
   1. Control by room thermostat to maintain room temperature setting.

2.04 ACCESSORY EQUIPMENT

A. Room Thermostat: Wall-mounted, electric solid state microcomputer based room thermostat with remote sensor to maintain temperature setting; low-voltage; with following features:
   1. System selector switch (heat-off-cool) and fan control switch (auto-on).
   2. Automatic switching from heating to cooling.
   3. Preferential rate control to minimize overshoot and deviation from setpoint.
   4. Programming based on weekdays, Saturday and Sunday.
   5. Thermostat Display:
      a. Actual room temperature.
      b. Programmed temperature.
      c. System Mode Indication: Heating, Cooling, Fan Auto, Off, and On, Auto or On, Off.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions and requirements of local authorities having jurisdiction.

B. Install in accordance with NFPA 90A and NFPA 90B.

C. Install refrigeration systems in accordance with ASHRAE Std 15.

D. Pipe drain from cooling coils to nearest floor drain.

END OF SECTION

SECTION 23 8200
CONVECTION HEATING AND COOLING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fan-coil units.

B. Electric unit heaters.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. AHRI 440 - Performance Rating of Room Fan-Coils; 2008.

A. AHRI Directory of Certified Product Performance - Air-Conditioning, Heating, and Refrigeration Institute (AHRI); Current Edition.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide typical catalog of information including arrangements.

C. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

PART 2 PRODUCTS

2.01 FAN-COIL UNITS

A. Performance Data and Safety Requirements:
   1. Unit capacities certified in accordance with AHRI 440.
   2. Provide products listed, classified, and labeled by Underwriters Laboratories Inc. (UL), Intertek (ETL), or testing firm acceptable to authority having jurisdiction as suitable for purpose indicated.
   3. Insulation to comply with NFPA 90A requirements for flame spread and smoke generation.
   4. Equipment wiring to comply with requirements of NFPA 70.

B. Required Directory Listings: AHRI Directory of Certified Product Performance - Air-Conditioning, Heating, and Refrigeration Institute (AHRI).

C. Coils:
   1. Evenly spaced aluminum fins mechanically bonded to copper tubes.
   2. Water Coil: Suitable for working temperatures not less than 200 degrees F.
   3. Provide drain pan under cooling coil easily removable for cleaning.

D. Coil Piping Packages:
   1. Hoses:
      a. Provide hoses for all units for connection to main water supply and return headers.
      b. Length: 2 feet.
      c. Material: Braided stainless steel rated to minimum 400 psi at 265 degrees F.

E. Finish: Factory applied baked primer coat on visible surfaces of enclosure or cabinet.

F. Fans: Centrifugal forward-curved double-width wheels, statically and dynamically balanced, direct driven.

G. Motor: Tap wound multiple speed permanent split capacitor with sleeve bearings, resiliently mounted.

H. Controls:
   1. Provide units with control valves furnished by the automatic temperature controls manufacturer.
   2. Controls Interface:
      a. Relay board.
      b. 24-volt transformer.

I. Filter: Easily removed 1 inch thick glass fiber throw-away type, located to filter air before coil.

2.02 ELECTRIC UNIT HEATERS

A. Provide products listed, classified, and labeled by Underwriters Laboratories Inc. (UL), Intertek (ETL), or testing firm acceptable to authority having jurisdiction as suitable for purpose indicated.

B. Heating Element Assembly:
   1. Thermal safety cut-out within electric terminal box with automatically reset switch located near electric terminal box.
   2. Horizontal Projection Units:
      a. Nickel chromium resistance wire surrounded with magnesium oxide and sheathed in steel, spiral-finned tubes.

C. Housing:
   1. Suitable for ceiling or high altitude mount using provided hardware appendages.
   2. Horizontal Projection Units:
      a. Construction materials to consist of heavy gauge steel with galvanized, polyester powder coat, or high gloss baked enamel finish.
      b. Provide with threaded holes for threaded rod suspension.
      c. Provisions for access to internal components for maintenance, adjustments, and repair.

D. Air Inlets and Outlets:
   1. Inlets: Provide stamped louvers or protective grilles with fan blade guard.
   2. Outlets: Provide diffuser cones, directional louvers, or radial diffusers.

E. Fan: Factory balanced, direct drive, axial type with fan guard.

F. Motor: Totally enclosed, thermally protected, and provided with permanently lubricated bearings.

G. Controls:
   1. Built-in line-voltage thermostat.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are suitable for installation.

B. Verify that field measurements are as indicated on drawings.

3.02 INSTALLATION

A. Install in accordance with manufacturer's recommendations.

B. Do not damage equipment or finishes.

C. Unit Heaters:

1. Hang from building structure, with pipe hangers anchored to building, not from piping or electrical conduit.
2. Mount as high as possible to maintain greatest headroom unless otherwise indicated.

D. Fan-Coil Units:
   1. Install as indicated.

E. Units with Hydronic Coils:
   1. Provide with shut-off valve on supply piping and tamper-proof, balancing valve with memory stop on return piping.
   2. If not easily accessible, extend air vent to exterior surface of cabinet for ease of servicing.
   3. Provide float operated automatic air vents with stop valve for fan coil units and unit heaters.

F. Units with Cooling Coils: Connect drain pan to condensate drain.

END OF SECTION

SECTION 26 0500
GENERAL REQUIREMENTS, ELECTRICAL

CPART 1 GENERAL

1.01 WORK INCLUDED

A. This section is applicable to and a part of all Division 26 sections of the Project Manual.

1.02 QUALITY ASSURANCE

A. Publications
   1. Copies: Obtain copies of trade association standards and publication wherever needed for proper execution of the work.
   2. Publication Date: Comply with the issue of applicable standard or publication which is in effect at the date shown on these contract documents. Obtain approval from the Architect-Engineer to comply with a later issue of a standard or publication.
   3. Conflicting Requirements: Report to the Architect-Engineer where application of a trade association standard or publication appears to be in conflict with the requirements of the contract documents.

B. Product Standards: Listed in the current edition of UL "Electrical Construction Materials Directory," or ETL if such a listing exists for the particular type of item specified.

C. Reference Standards:
   1. Meet or exceed the recommendations and requirements of reference standards.
   2. Submit proof (stamp, label, published listing or independent certified test).

D. Servicing: Provide products supported by a service organization that is reasonably convenient to the site.

E. Nameplates:
   1. Securely attach to each major component of equipment, visible and readable, name, address, and model identification number on a plate.
   2. Do not cover with paint, insulation, or other material.

F. Manufacturer's Instructions: Follow the manufacturer's published instructions in preparing, assembling, installing, erecting, and cleaning manufactured materials or equipment, unless otherwise indicated by the Contract Documents.

G. Capacities: Meet or exceed capacity requirements indicated. Stay within maximums, minimums and other limits. Prevent components or systems from becoming inoperative or damaged because of start-up, overload, or other conditions.

H. Suitability: Provide products suitable for the pressures, temperatures, fluids, voltages, environmental conditions, and other conditions encountered by the indicated application.

I. Protection from Moving Parts: Provide enclosures and guards for belts, pulleys, chains, gears, couplings, projecting set-screws, keys, hot surfaces and other hazardous parts located where persons can come in close proximity.

J. Spare Parts Data: Provide spare parts data prior to Substantial Completion.

K. Standard Products: Provide standard cataloged products of manufacturers regularly engaged in the manufacture of products that essentially duplicate materials and equipment that have been in satisfactory use at least two (2) years.

L. Connections to Utilities:
   1. Provide the services of a person or company approved by the respective utility authority to make connections to:
      a. Water supplies.

b. Sanitary sewer.
c. Storm sewer.
d. Gas.
e. Electrical power.
f. Telephone.
g. Other utilities.

1.03 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of products of this type, and whose products have been in satisfactory use in similar service for not less than 5 years.
1. Warranty:
2. The Contractor shall warrant his work against defective materials and workmanship for a period of one year from the date of acceptance of the entire project, unless specific longer term is specified with Individual System Specification.
3. Neither Final Payment nor any provisions in Contract Documents shall relieve the Contractor of the responsibility for faulty materials or workmanship.
4. The Owner shall give notice of observed defects with reasonable promptness.
5. This Guarantee shall not be construed to include the normal maintenance of the various components of the system covered by these specifications.

B. Submittals:
1. Electrical Product Data Submittals to be organized and submitted as ONE complete submittal as follows (excludes shop drawings and electrical panel submittals):
a. Cover Sheet listing project name, date, GC, Subcontractor
b. Index Sheet
c. The contractor shall include a formal letter to the engineer, included in the submittal after the index sheet, any instance in which the submittals are known to differ from the requirements of the contract documents.
d. Organize all required items by numerical specification section with tabbed dividers including section number and title. Each section to provide a subsequent index cover.
e. Submittals not organized as indicated above may be rejected without review.
2. The contractor may require his subcontractors to provide coordination drawings indicating all trades, such drawings will not be reviewed by the engineer.
3. Shop drawings are to fully drawn/designed and coordinated by the contractor. Any replication of original bid documents will be rejected. Electronic shop drawings are NOT acceptable.

C. Project Record Documents:
1. The Contractor shall keep a set of plans on the job, noting daily all changes made in connection with the final installation including exact dimensioned locations of all new and uncovered existing utility piping outside the Building.
2. Upon submitting request for Final Payment, Contractor shall turn over to the Architect-Engineer, for subsequent transmittal to the Owner, clean, neatly marked set of reproducible plans showing “as installed” work.
3. In addition to the above, the Contractor shall accumulate during the Job’s progress the following data turned over to the Architect-Engineer for checking and subsequent delivery to the Owner:
a. All warranties, guarantees and manufacturer’s direction on equipment and material covered by the Contract
b. Approved fixture/equipment brochures
c. Copies of approved Shop Drawings

d. Set of operating instructions. Operating instructions shall also include recommended maintenance and seasonal changeover procedures.
e. Any and all data and/or plans required during construction.
f. Repair parts lists of all major items and equipment including name, address and telephone number of the local supplier or agent.
g. The first page or pages shall have the name, addresses and telephone numbers of the following; General Contractor and all sub-contractors, Major Equipment Suppliers.

D. Training:
1. Upon completion of the work and at a time designated by the Owner's representative, provide a formal training session for the Owner's operating personnel to include location, operation and maintenance of all the mechanical, electrical and plumbing equipment and systems.
2. Before proceeding with instruction, prepare a typed outline in triplicate listing the subjects that will be covered. Submit the outline for review by the Owner's representative one week prior to training session.
3. At the conclusion of the instruction, obtain signatures of the attendees on each copy of the outline to signify that they have proper understanding of the operation and maintenance of the systems. Submit the signed outlines to the Owner's representative and Engineer as a condition of final acceptance.

E. Plans and Specifications:
1. The plans show diagrammatically the locations of the various lines, ducts, conduits, fixtures and equipment and the method of connecting and controlling them. It is not intended to show every connection in detail and all fittings required for a complete system.
2. The Systems shall include, but are not limited to, the items shown on the plans.
3. Exact locations of these items shall be determined by reference to the general plans and measurements of the Building and in cooperation with other Contractors, and in all instances, shall be subject to the approval of the Architect-Engineer.
4. The Architect-Engineer reserves the right to make any reasonable change in the location of any part this work without additional cost to the Owner.

F. Utilities, Locations and Elevations:
1. Locations and elevations of the various utilities within this scope of work have been obtained from the City, Owner and/or other substantially reliable sources and are offered separately from the Contract Documents, as a general guide only, without any guarantees at to the accuracy.
2. The Contractor shall examine the site, shall verify to his own satisfaction the locations, elevations and the availability / characteristics (voltage/phase/pressure/capacity) of all utilities and services required, and shall adequately inform himself as to their relation to the work; the submission of bids or proposals shall be deemed evidence thereof.
3. The Contractor shall coordinate all services with the respective Utility Company or Agency during construction; coordinate changes made by Utility Companies or Agencies to the design of the project, and coordinate with the Owner, Architect-Engineer, and Utility the scheduling of any shutdowns or delays that may occur in providing service.
4. The Contractor shall verify location / depth / direction of flow, conduct all necessary tests, inspections, coordinate with Owner's representatives and Utilities, and check for existing underground utilities before ditching / trenching / drilling.
5. The Contractor shall be responsible for repair of any cut of damaged lines or utilities he uncovers and disrupts. There are lines and utilities not shown on the plans.

1.04 OBSERVATIONS

A. The Engineer reserves the right to review the work whenever advisable.

B. The Contractor shall have a representative present on each observation and shall give assistance as may be required to facilitate such observations or reviews.

C. The Engineer's field observation report is carried out in accordance with the General Conditions of the Contract for Construction and does not imply that the Engineer has made exhaustive or continuous on-site inspections. The Engineers report does not relieve the Contractor of responsibility from performing inspections on portions of the work to determine that such portions are in proper condition to receive subsequent work. Omission of nonconforming items within this report does not imply that the Engineer accepts work not in conformance with the Contract Documents.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Handle products carefully to prevent internal component damage, breaking or denting.

B. Store products in clean, dry space, protected from dirt, fumes, water, construction debris and physical damage.

C. Do not install damaged equipment or materials.

1.06 PRODUCT APPLICATION, INSTALLATION, AND OPERATION

A. General: For products incorporated into the Work, the Contractor shall ascertain the following:
   1. Application:
      a. The manufacturer's representatives have reviewed the proposed application of their products.
      b. The application and product are compatible regarding:
         1) Operation.
         2) Electric Source.
         3) Piping.
         4) Controls.
         5) Location.
         6) Proximity to other products and elements of the work.
         7) Structural support and integrity.
         8) Other pertinent factors.

B. Installation: The installers were instructed in the manufacturer's recommended procedure for installation, and the product was installed according to the manufacturer's recommendations.

C. Operation: The manufacturer's representative has witnessed and reviewed the product operation subsequent to system start-up, the products are operating as intended by the Contract Documents, and the application and product are compatible regarding the same factors named above.

D. Installation: Submit letter following installation of the manufacturer's product stating the following:
   1. The installers were instructed in the manufacturer's recommended procedure for installation.
   2. The product was installed according to the manufacturer's recommendations.

E. Operation: Submit letter with Owner's final documents stating the following:
   1. The manufacturer's representative has witnessed and reviewed the product operation subsequent to system start-up.
   2. The products are operating as intended by the Contract Documents.
   3. The application and product are compatible regarding the same factors named above.

F. Signature on Letter: By manufacturer's representative

PART 2 PRODUCTS

2.01 NOT USED

PART 3 EXECUTION

3.01 TESTING:

A. Reference individual sections for required testing.

END OF SECTION

SECTION 26 0506
ELECTRICAL SPECIAL PROVISIONS

GENERAL

1.01 DESCRIPTION OF WORK

A. The work contemplated under this section of the specifications includes the furnishing of all labor and materials necessary for the complete installation of wiring in conduit for lighting and power, etc., as hereinafter specified and as shown on the Drawings.

B. Work includes, but is not limited to, the following:
1. Administrative Communication System
2. Aiming of fixtures
3. Area lights
4. Clock and bell system
5. Computer cable rough in
6. Connections to equipment furnished under other sections of these specifications
7. Control wiring and power
8. Dry type transformers
9. Fire alarm
10. Intercom
11. Interior building lighting
12. Manholes
13. Other systems as required or specified
14. Outdoor lighting systems
15. Panel boards
16. Photo controls
17. Poles, brackets and platforms
18. Public address system
19. Relays and contactors
20. Service entrance equipment
21. Surface Raceway/Wiring System
22. Switchboards
23. Telephone, Antenna rough in
24. Testing of wire and cable insulation
25. Wiring for lighting and power

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. General reference is made to all other Divisions of these Specifications as they relate to Electrical work.

B. In general, the contractor shall become familiar with the electrical work described elsewhere, and provide the necessary wiring components and labor to accomplish a completed workable system, whether or not it is specifically called for or enumerated in the "Electrical Drawings" or "Electrical Specifications".

C. Particular reference is made to:
1. Division 2; Sitework.
2. Division 5; Metals.
3. Division 9; Finishes.
4. Division 11; Equipment.
5. Division 13; Instrumentation and Control.
6. Division 14; Conveying Systems.

7. Division 23; Mechanical.

1.03 TRENCH SAFETY SYSTEMS

A. As a result of HB 662 and HB 665 being passed by the 70th Legislature of Texas and signed into law by the Governor of the State of Texas, Owner and Contractor do hereby agree for the construction of the project that the Contractor shall utilize adequate safety systems meeting Occupational Safety and Health Administration (OSHA) standards for trench excavation when said trench excavation exceeds a depth of five feet, and at other occasions as appropriate for worker safety. (Title 29 CFR Part 1;926, Subpart P.) In addition, Contractor shall implement for its employees, sub contractors, agents, and representatives, a safety program for any trench system utilized in this construction project.

B. The Term "Trench" and "Trench System" includes excavation for manholes, tanks, sumps, catch basins, valve boxes, pull boxes, pipe, conduit, piers, and other appurtenances and structures related to the systems being trenched for.

1.04 QUALITY ASSURANCE AND STANDARDS

A. In addition to the requirements outlined in other sections of the specifications the following standards are imposed as applicable to the work in each instance:
   1. NECA standards for installation.
   2. NFPA No. 70, National Electric Code.
   3. Local Codes and Ordinances.
   4. COG Standard Specifications for Public Works Construction.
   5. Title 25, Health Services, Part 2, Texas Department of Health, Chapter 145, Long Term Care Subchapter Q.

B. Where local codes or practices exceed or conflict with the NEC, it shall be the Contractor's responsibility to perform the work in accordance with the local code prevailing and local interpretations thereof. Any such additional work shall be performed at no additional cost to the Owner.

C. Materials and components shall be UL listed and approved for the purpose intended.

D. The Contractor shall obtain all permits required to commence work and, upon completion of the Work, obtain and deliver to the Owner's Representative a Certificate of Inspection and Approval from the State Board of Fire Underwriters, the local authority having jurisdiction, Texas and other authority having jurisdiction. Required permit fees shall be paid by the Contractor.

1.05 LISTING OF ASSOCIATIONS AND STANDARDS

A. ANSI: American National Standards Institute 1430 Broadway; New York, NY 10018.

B. ASTM: American Society for Testing and Materials, 1916 Race Street; Philadelphia, PA 19103.

C. CBM: Certified Ballast Manufacturers Association, 2116 Keith Building; Cleveland, OH 44115.

D. IEEE: Institute of Electrical & Electronics Engineers, 345 East 47th St.; New York, NY 10017.

E. ICEA: Insulated Cable Engineers Association, P O Box P, South Yarmouth, MA 02664.

F. NEC: National Electrical Code; NFPA No. 70-87.

G. NECA: National Electrical Contractors Association, Inc., 7315 Wisconsin Ave.; Washington, DC 20014.

H. NEMA: National Electrical Manufacturers Association, 155 East 44th St; New York, NY 10017.

I. NESC: National Electrical Safety Code, ANSI 2.

J. NFPA: National Fire Protection Association, 60 Batterymarch Street; Boston, MA 02110.

K. OSHA: Occupational Safety and Health Administration, US Dept of Labor; Washington, DC 20402.

L. UL: Underwriters Laboratories, Inc., 333 Pfigsten Road; Northbrook, IL 60062.

1.06 ELECTRICAL SYMBOLS

A. The electrical contract drawings are diagrammatic and show requirements by the use of graphic symbols. In general, these are the recognized symbols of the industry and of the engineering profession.

B. Listing of Symbols: The listing of specific graphic symbols used to show the electrical work on the contract documents is shown on the drawings.

1.07 SUBMITTALS

A. Refer to other sections for general requirements concerning work related submittals.

B. The Contractor shall review all submittals for compliance with the requirements and intent of the contract and shall evidence his review and approval by a signed and dated stamp or acknowledgment of his review and approval. The contractor shall further note each and every deviation from the requirements or intent of the contract documents. Submittals which do not attest to the foregoing will not be considered as the required submittals, and will be returned to the Contractor for his further consideration.

C. Submit the following manufacturers product data, completely marked and annotated to include all options, materials, and finishes as appropriate to the equipment:
   1. Administrative communication system.
   2. Ballasts.
   3. Circuit Breakers.
   4. Clock and bell system.
   5. Contactors.
   6. Distribution Panel boards.
   7. Dry Type Transformers.
   8. Fuses.
   9. Fusible Switches.
   10. Lamps.
   11. Lighting and Appliance Panel boards.
   12. Lighting Poles & Appurtenances.
   13. Lighting Fixtures.
   14. Medium Voltage Cable & Terminators.
   15. Medium Voltage Oil Switch & Controls.
   16. Motor Starters.
   17. Nurse Call System.
   18. Oil Filled Transformers.
   19. Overhead pole line products.
   20. Photocells.
   21. Relays.
   22. Safety Switches.
   23. Service Conduit.
   24. Switchboards.
   25. Time Clocks.
   26. Wire Manufacturer.
   27. Wiring Devices.

D. Submit the following shop drawings:
   1. Generator set foundation drawings.
   2. Lighting Poles and appurtenances.
   3. Relocatable wiring system schematic and layout.

E. Submit the following certifications:
   1. Compatibility with existing equipment.
   2. Pole loading computations and seal.
   3. Concrete mix slip certification.

1.08 PROJECT CLOSEOUT

A. Record Drawings: In addition to the requirements of Division 01 and General Conditions, record drawings shall include the following:
   1. One line wiring diagram of the Medium voltage and Low voltage distribution systems.
   2. Actual in place conduit and cable layouts with schedule of conduit sizes and number and size of conductors.
   3. Layouts of the lighting arrangements.
   4. Control wiring diagrams with terminal numbers and all control devices identified.

PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Except as otherwise indicated, provide materials and equipment manufacturer's standard materials and components as indicated by their published product information; designed and constructed as required for a complete installation.

2.02 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Handle electrical materials and equipment carefully to prevent internal components damage, breaking, denting, and scoring the enclosure finish. Do not install damaged equipment or materials.

B. Store electrical materials and equipment in clean dry space. Protect same from dirt, fumes, water, construction debris and physical damage.

C. Protect electrical from abuse or damage by other trades on the project. Do not permit electrical materials and equipment to be used for supports, worktables, scaffolds, etc.

2.03 CONCRETE FOR ELECTRICAL WORK

A. Refer to applicable Division 3 specification sections.

B. Concrete for electrical work shall be minimum 3000 psi after 28 days. Concrete shall be by reputable local ready-mix company. Mix certifications shall accompany each load of concrete. Concrete shall be placed in accordance with accepted standards of placement. Owner's representative reserves the right to reject any concrete not mixed or poured in accordance with good practice. Such concrete shall be removed and replaced at the Contractor's sole expense. Owner's representative may require at least two (2) test cylinders be poured from each batch.

C. Reinforcing steel shall be placed as shown and scheduled.

EXECUTION

3.01 INSPECTION

A. Installer must examine the areas and conditions under which electrical equipment is to be installed and notify the Contractor and Owner's Representative in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 TESTING

A. Perform in accordance with manufacturer’s printed testing procedures, applicable industry standards, ANSI standards, IEEE standards, NEMA standards and as directed by the Engineer.

B. Provide testing equipment in good working order and which complies with the applicable industry standards and manufacturer's requirements. Include a list of testing equipment used and date of last calibration.

C. Test the following:
   1. Feeder conductors to main switchboard.
   2. Feeder conductors from switchboard to panelboards.
   3. Grounding means all switchgear.
   4. Grounding of the Electrical system neutral: Ground resistance shall not exceed 10 ohms.
   5. Equipment grounds for each feeder: Ground resistance shall not exceed 25 ohms.
   6. Grounds for each transformer: Ground resistance shall not exceed 25 ohms.

D. Perform all tests in the presence of the Engineer, Architect or the Owner in accordance with the requirements of this section.

E. Submit all results to the Engineer with ten (10) working days from the time the test is performed.

F. Document all test results and provide a signed report by the testing technician as witnessed. Reports shall include date, time, weather conditions, field conditions, test data, instruments used and a brief description of the test. Include reports in operation manuals.

3.03 INSTALLATION OF ELECTRICAL MATERIALS AND EQUIPMENT

A. Install electrical materials and equipment where shown and in accordance with recognized industry practices to ensure that the completed installation of electrical materials and equipment, and the various types of equipment which the electrical system serves the intended purposes and functions. Comply with the requirements of NEMA and NEC standards, and applicable portions of NECA's "Standard of Installation", for installation of electrical materials and equipment.

3.04 CUTTING AND PATCHING

A. Cut and patch walls, floors, etc., resulting from the electrical work.

B. Openings cut through concrete and masonry shall be made with masonry saws and/or core drills and at such locations acceptable to the Owner's Representative. Impact type equipment will not be used except where specifically acceptable to the Owner's Representative. Openings in precast concrete slabs for conduits, outlet boxes, etc., shall be core drilled to exact size, and only upon the express approval of the Owner's Representative.

C. Openings shall be restored to as new condition under the appropriate specification section for the materials involved and shall match remaining surrounding materials and finishes.

D. Conduit and sleeves, pitch pans, and flashing compatible with the roofing installation shall be provided for roof penetration.

3.05 EXCAVATING FOR ELECTRICAL WORK

A. The work of this article is defined to include whatever excavating and back filling is necessary to install the electrical work. Coordinate the work with other excavating and back filling in the same areas, including dewatering, flood protection provisions, and other temporary facilities. Coordinate the work with other work in the same area, including other underground services, landscape development, paving, and floor slabs on grade. Coordinate with weather conditions and provide temporary facilities needed for protection and proper performance of excavating and back filling. Except as otherwise indicated, comply with the applicable provisions of other sections for electrical work excavating and back filling.

3.06 HOUSEKEEPING PADS

A. Provide housekeeping pads for all floor or ground mounted electrical equipment. Housekeeping pads shall consist of a reinforced concrete pad, at least 4" higher than surrounding floor or

grade, extending at least 6" from under equipment mounted thereon. Reinforcing shall be number 3 bars, 12" on centers each way. Interior concrete pads shall be poured integrally with the floor construction using the same concrete mix. Exterior pads shall be poured monolithically with surrounding equipment and shall additionally include a grade beam of at least 12" deep by 12" wide all around the perimeter of the pad. Pads shall have chamfered edges and shall be trowel finished.

B. Provide housekeeping pads for all conduit stubs from the floor or earth such that conduits are protected at their exit from standing moisture or damage.

3.07 LOCKING OF ELECTRICAL FACILITIES

A. Provide padlocks or lockable latches for electrical facilities subject to unauthorized entry, such as panel boards, transformers, relay cabinets, etc. Key all locks alike. Furnish Owner with two keys per lock up to a quantity of ten keys. Install locks immediately upon installation of electrical facility.

3.08 PAINTING OF ELECTRICAL EQUIPMENT

A. The contractor shall obtain quantities of touch paint from the manufacturers of the various equipment for touch of paint damaged or scratched during construction activity. Paint type and color shall match, and workmanship shall be of the highest order to present a pleasing appearance. Where extensive painting is required or for complete painting, the items shall be factory painted, or if applied by the Contractor, painting shall be performed in accordance with the "Painting" sections of these specifications as applicable to the particular items.

3.09 ELECTRIC METERING

A. Install metering equipment as directed by the local power company, using such equipment as furnished by the local power company, installed in such locations and in the manner directed by the power company, and in accordance with their standards.

END OF SECTION

SECTION 26 0519
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Single conductor building wire.
B. Underground feeder and branch-circuit cable.
C. Service entrance cable.
D. Armored cable.
E. Metal-clad cable.
F. Power and control tray cable.
G. Variable-frequency drive cable.
H. Manufactured wiring systems.
I. Wiring connectors.
J. Electrical tape.
K. Heat shrink tubing.
L. Oxide inhibiting compound.
M. Wire pulling lubricant.
N. Cable ties.
O. Firestop sleeves.

1.02 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.
B. Section 26 0526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
D. Section 26 2100 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conductors.
E. Section 31 2316 - Excavation.
F. Section 31 2323 - Fill: Bedding and backfilling.

1.03 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2024).
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 D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2024.

F. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2020.

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.

H. FM 3971 - Fire Protective Coatings and Wraps for Grouped Cables; 2019.

I. IEEE 383 - IEEE Standard for Qualifying Electric Cables and Splices for Nuclear Facilities; 2015.

J. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

K. NECA 120 - Standard for Installing Armored Cable (AC) and Type Metal-Clad (MC) Cable; 2018.

L. NECA 121 - Standard for Installing Nonmetallic-Sheathed Cable (Type NM-B) and Underground Feeder and Branch-Circuit Cable (Type UF); 2024.

M. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2021.

N. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

O. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

P. NFPA 79 - Electrical Standard for Industrial Machinery; 2021.

Q. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.

R. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.

S. UL 267 - Outline of Investigation for Wire-Pulling Compounds; Current Edition, Including All Revisions.

T. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.

U. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.

V. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.

W. UL 493 - Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables; Current Edition, Including All Revisions.

X. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

Y. UL 854 - Service-Entrance Cables; Current Edition, Including All Revisions.

Z. UL 1277 - Electrical Power and Control Tray Cables with Optional Optical-Fiber Members; Current Edition, Including All Revisions.

AA. UL 2277 - Outline of Investigation for Flexible Motor Supply Cable and Wind Turbine Tray Cable; Current Edition, Including All Revisions.

1.04 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 the installation of direct burial cable with other trades to avoid conflicts with piping or other potential conflicts.

3. Coordinate with electrical equipment installed under other sections to provide terminations 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.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Sustainable Design Documentation: Submit manufacturer's product data on conductor and cable showing compliance with specified lead content requirements.

C. Manufactured Wiring System Shop Drawings: Provide plan views indicating proposed system layout with components identified; indicate branch circuit connections.

D. Wire Pulling Lubricant: Certification of compatibility with conductors/cables where used with the following insulation/jacket types:

E. Field Quality Control Test Reports.

F. 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.

G. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.08 FIELD CONDITIONS

A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F, unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
   1. Exceptions:
      a. Use variable-frequency drive cable for connection between variable-frequency motor controllers and associated motors.

C. Nonmetallic-sheathed cable is not permitted.

2.02 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 0526.

H. Conductors and Cables Installed Where Exposed to Direct Rays of Sun: Listed and labeled as sunlight resistant.

I. Conductor Material:
   1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
   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.

J. 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.

K. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

L. 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: Orange.
         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 control circuits, comply with manufacturer's recommended color code.

2.03 SINGLE CONDUCTOR BUILDING WIRE

A. Manufacturers:
   1. Copper Building Wire:
      a. Encore Wire Corporation: www.encorewire.com/#sle.
      b. General Cable Technologies Corporation; _____: www.generalcable.com/#sle.
      c. Service Wire Co: www.servicewire.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.

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. Size 4 AWG and Larger: Type XHHW-2.
      b. Installed Underground: Type XHHW-2.
   2. Aluminum Building Wire (only where specifically indicated or permitted for substitution): Type XHHW-2.

2.04 UNDERGROUND FEEDER AND BRANCH-CIRCUIT CABLE

A. Manufacturers:
   1. Cerro Wire LLC: www.cerrowire.com/#sle.
   2. Encore Wire Corporation: www.encorewire.com/#sle.
   3. Service Wire Co: www.servicewire.com/#sle.
   4. Southwire Company: www.southwire.com/#sle.

B. Description: NFPA 70, Type UF multiple-conductor cable listed and labeled as complying with UL 493, Type UF-B.

C. Provide equipment grounding conductor unless otherwise indicated.

D. Conductor Stranding:
   1. Size 10 AWG and Smaller: Solid.
   2. Size 8 AWG and Larger: Stranded.

E. Insulation Voltage Rating: 600 V.

2.05 SERVICE ENTRANCE CABLE

A. Manufacturers:
   1. Copper Service Entrance Cable:
      a. Cerro Wire LLC: www.cerrowire.com/#sle.
      b. Encore Wire Corporation: www.encorewire.com/#sle.
      c. Southwire Company: www.southwire.com/#sle.
   2. Aluminum Service Entrance Cable:
      a. Encore Wire Corporation: www.encorewire.com/#sle.
      b. Southwire Company: www.southwire.com/#sle.

B. Service Entrance Cable for Underground Use: NFPA 70, Type USE single-conductor cable listed and labeled as complying with UL 854, Type USE-2, and with UL 44 Type RHH/RHW-2.

C. Conductor Stranding: Stranded.

D. Insulation Voltage Rating: 600 V.

2.06 POWER AND CONTROL TRAY CABLE

A. Manufacturers:
   1. Encore Wire Corporation: www.encorewire.com/#sle.
   2. Service Wire Co: www.servicewire.com/#sle.
   3. Southwire Company: www.southwire.com/#sle.

B. Description: NFPA 70, Type TC cable listed and labeled as complying with UL 1277.

C. Conductor Stranding: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation: Type XHHW or XHHW-2.

F. Grounding: Full-size integral equipment grounding conductor.

G. Provide metallic shield.

H. Jacket: PVC or Chlorinated Polyethylene (CPE).

2.07 VARIABLE-FREQUENCY DRIVE CABLE

A. Manufacturers:
   1. Service Wire Co; ServiceDrive: www.servicewire.com/#sle.

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).

2.08 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. Connectors for Grounding and Bonding: Comply with Section 26 0526.

C. 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 mechanical connectors or compression connectors.
   3. Connectors for Aluminum Conductors: Use compression connectors or mechanical connectors.

D. 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. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
   5. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
   6. Aluminum Conductors: Use mechanical connectors for all connections.
   7. Stranded Conductors Size 10 AWG and Smaller: Use crimped terminals for connections to terminal screws.
   8. Conductors for Control Circuits: Use crimped terminals for all connections.

E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.

F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.

G. 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.
   1. Manufacturers:
      a. 3M: www.3m.com/#sle.
      b. Ideal Industries, Inc: www.idealindustries.com/#sle.
      c. NSI Industries LLC: www.nsiindustries.com/#sle.

H. Mechanical Connectors: Provide bolted type or set-screw type.
   1. Manufacturers:
      a. Burndy LLC: www.burndy.com/#sle.
      b. Ilsco: www.ilsco.com/#sle.
      c. Thomas & Betts Corporation: www.tnb.com/#sle.

I. Compression Connectors: Provide circumferential type or hex type crimp configuration.
   1. Manufacturers:
      a. Burndy LLC: www.burndy.com/#sle.
      b. Ilsco: www.ilsco.com/#sle.
      c. Thomas & Betts Corporation: www.tnb.com/#sle.

J. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.
   1. Manufacturers:
      a. Burndy LLC: www.burndy.com/#sle.
      b. Ilsco: www.ilsco.com/#sle.
      c. Thomas & Betts Corporation: www.tnb.com/#sle.

2.09 ACCESSORIES

A. Electrical Tape:
   1. Manufacturers:
      a. 3M: www.3m.com/#sle.
      b. Plymouth Rubber Europa: www.plymouthrubber.com/#sle.
   2. 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.
   3. 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.
   4. 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.
   5. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil; suitable for continuous temperature environment up to 176 degrees F.
   6. Varnished Cambric Electrical Tape: Cotton cambric fabric tape, with or without adhesive, oil-primed and coated with high-grade insulating varnish; minimum thickness of 7 mil; suitable for continuous temperature environment up to 221 degrees F.
   7. 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.
   1. Manufacturers:
      a. 3M: www.3m.com/#sle.
      b. Burndy LLC: www.burndy.com/#sle.
      c. Thomas & Betts Corporation: www.tnb.com/#sle.

C. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.
   1. Manufacturers:
      a. Burndy LLC: www.burndy.com/#sle.
      b. Ideal Industries, Inc: www.idealindustries.com/#sle.
      c. Ilsco: www.ilsco.com/#sle.

D. Wire Pulling Lubricant:
   1. Manufacturers:
      a. 3M: www.3m.com/#sle.
      b. American Polywater Corporation: www.polywater.com/#sle.
      c. Ideal Industries, Inc: www.idealindustries.com/#sle.
   2. Listed and labeled as complying with UL 267.
   3. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
   4. Suitable for use at installation temperature.

E. Cable Ties: Material and tensile strength rating suitable for application.
   1. Manufacturers:
      a. Burndy LLC: www.burndy.com/#sle.

F. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.
   1. Products:
      a. HoldRite, a brand of Reliance Worldwide Corporation; HydroFlame Pro Series/HydroFlame Custom Built: www.holdrite.com/#sle.

G. Fire-Protective Coating for Electrical Conductors and Cables: Field-applied, intumescent or ablative coating designed to prevent ignition and propagation of fire along thermoplastic-insulated conductors and cables.
   1. Pass flammability tests of one of the following:
      a. ASTM E84, Class A; maximum flame spread index of 25.
      b. FM 3971.
      c. IEEE 383.

PART 3 EXECUTION

3.01 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.

3.02 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. Include circuit lengths required to install connected devices within 10 ft of location indicated.
   5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
   6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
   7. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is not permitted.
   8. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among 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.
   9. 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.

B. Install products in accordance with manufacturer's instructions.

C. Perform work in accordance with NECA 1 (general workmanship).

D. Install underground feeder and branch-circuit cable (Type UF-B) in accordance with NECA 121.

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.

G. Exposed Cable Installation (only where specifically permitted):
   1. Route cables parallel or perpendicular to building structural members and surfaces.
   2. Protect cables from physical damage.

H. Direct Burial Cable Installation:
   1. Provide trenching and backfilling in accordance with Section 31 2316 - Excavation and Section 31 2323 - Fill.
   2. Install cable with minimum cover of 24 inches unless otherwise indicated or required.
   3. Protect cables from damage in accordance with NFPA 70.
   4. Provide underground warning tape in accordance with Section 26 0553 along entire cable length.

I. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

J. 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.
   2. Installation in Vertical Raceways: Provide supports where vertical rise exceeds permissible limits.

K. 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.

L. Variable-Frequency Drive Cable: Terminate shielding at both variable-frequency motor controller and associated motor using glands or termination kits recommended by manufacturer.

M. Install conductors with a minimum of 12 inches of slack at each outlet.

N. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

O. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

P. 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. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

Q. 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.
      b. For taped connections likely to require re-entering, including motor leads, first apply varnished cambric electrical tape, followed by adequate amount of rubber splicing electrical 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.

R. Insulate ends of spare conductors using vinyl insulating electrical tape.

S. 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.

T. Identify conductors and cables in accordance with Section 26 0553.

U. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

V. 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.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - 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.

END OF SECTION

SECTION 26 0526
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 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. Chemically-enhanced ground electrodes.

G. Ground plate electrodes.

H. Ground enhancement material.

I. Ground access wells.

1.02 RELATED REQUIREMENTS

A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
   1. Includes oxide inhibiting compound.

B. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2025.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

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; 2025.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. NFPA 99 - Health Care Facilities Code; 2024, with Errata.

G. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
   2. 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.

1.05 SUBMITTALS

A. See Section 01 3000 - 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.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 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 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.
   3. 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.

4. Ground Ring:
   a. Provide a ground ring encircling the building or structure consisting of bare copper conductor not less than 2 AWG in direct contact with earth, installed at a depth of not less than 30 inches.
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.
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 4 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.

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. Grounding for Separate Building or Structure Supplied by Feeder(s) or Branch Circuits:
1. Provide grounding electrode system for each separate building or structure.
2. Provide equipment grounding conductor routed with supply conductors.
3. For each disconnecting means, provide grounding electrode conductor to connect equipment ground bus to grounding electrode system.
4. Do not make any connections and remove any factory-installed jumpers between neutral (grounded) conductors and ground.

H. 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 nearest effectively grounded metal building frame. 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. 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.
5. 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.
6. Where the source and first disconnecting means are in separate enclosures, provide supply-side bonding jumper between source and first disconnecting means.

I. 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.
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.
   b. Metal gas piping.
   c. Metal process piping.
8. Provide bonding for metal building frame.
9. Provide bonding for metal siding not effectively bonded through attachment to metal building frame.
10. Provide redundant grounding and bonding for patient care areas of health care facilities in accordance with NFPA 70 and NFPA 99.

J. Isolated Ground System:
1. Where isolated ground receptacles or other isolated ground connections are indicated, provide separate isolated/insulated equipment grounding conductors.
2. Connect isolated/insulated equipment grounding conductors only to separate isolated/insulated equipment ground busses.
3. Connect the isolated/insulated equipment grounding conductors to the solidly bonded equipment ground bus only at the service disconnect or separately derived system disconnect. Do not make any other connections between isolated ground system and normal equipment ground system on the load side of this connection.

K. Communications Systems Grounding and Bonding:

1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with NFPA 70.
2. Provide bonding jumper in raceway from intersystem bonding termination 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 4 by 20 inches unless otherwise indicated or required.
    d. Ground Bar Mounting Height: 72 inches above finished floor unless otherwise indicated.

2.02 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 0526:
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.
3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
4. Manufacturers - Mechanical and Compression Connectors:
    a. Burndy LLC: www.burndy.com/#sle.
    b. nVent ERICO: www.nvent.com/#sle.
    c. 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.
2. Size: As indicated.
3. Holes for Connections: As indicated or as required for connections to be made.
4. Manufacturers:
    a. Harger Lightning & Grounding: www.harger.com/#sle.
    b. nVent ERICO: www.nvent.com/#sle.
    c. thermOweld, subsidiary of Continental Industries; division of Burndy LLC: www.thermoweld.com/#sle.

E. Ground Rod Electrodes:
1. Comply with NEMA GR 1.
2. Material: Copper-bonded (copper-clad) steel.

3. Size: 3/4 inch diameter by 10 feet length, unless otherwise indicated.
4. Manufacturers:
   a. allG Fabrication: www.allgfab.com/#sle.
   b. Galvan Industries, Inc: www.galvanelectrical.com/#sle.
   c. Harger Lightning & Grounding: www.harger.com/#sle.
   d. nVent ERICO: www.nvent.com/#sle.

F. Chemically-Enhanced Ground Electrodes:
1. Description: Copper tube factory-filled with electrolytic salts designed to provide a low-impedance ground in locations with high soil resistivity; straight (for vertical installations) or L-shaped (for horizontal installations) as indicated or as required.
2. Length: 10 feet.
3. Integral Pigtail: Factory-attached, sized not less than grounding electrode conductor to be attached.
4. Backfill Material: Grounding enhancement material recommended by electrode manufacturer.
5. Manufacturers:
   a. allG Fabrication: www.allgfab.com/#sle.
   b. Harger Lightning & Grounding: www.harger.com/#sle.
   c. nVent ERICO: www.nvent.com/#sle.
   d. thermOweld, subsidiary of Continental Industries; division of Burndy LLC: www.thermoweld.com/#sle.

G. Ground Plate Electrodes:
1. Material: Copper.
2. Size: 24 by 24 by 1/4 inches, unless otherwise indicated.
3. Manufacturers:
   a. allG Fabrication: www.allgfab.com/#sle.
   b. Harger Lightning & Grounding: www.harger.com/#sle.
   c. nVent ERICO: www.nvent.com/#sle.
   d. thermOweld, subsidiary of Continental Industries; division of Burndy LLC: www.thermoweld.com/#sle.

H. Ground Enhancement Material:
1. Description: Factory-mixed conductive material designed for permanent and maintenance-free improvement of grounding effectiveness by lowering resistivity.
2. Resistivity: Not more than 20 ohm-cm in final installed form.
3. Manufacturers:
   a. Harger Lightning & Grounding: www.harger.com/#sle.
   b. nVent ERICO; GEM: www.nvent.com/#sle.
   c. thermOweld, subsidiary of Continental Industries; division of Burndy LLC: www.thermoweld.com/#sle.

I. 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.
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".
5. Manufacturers:

a. allG Fabrication: www.allgfab.com/#sle.
b. Harger Lightning & Grounding: www.harger.com/#sle.
c. nVent ERICO: www.nvent.com/#sle.
d. thermOweld, subsidiary of Continental Industries; division of Burndy LLC: www.thermoweld.com/#sle.

PART 3 EXECUTION

3.01 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.

3.02 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.

D. Ground Plate Electrodes: Unless otherwise indicated, install ground plate electrodes at a depth of not less than 30 inches.

E. 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.

F. Identify grounding and bonding system components in accordance with Section 26 0553.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - 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 0529
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.02 RELATED REQUIREMENTS

A. Section 05 5000 - Metal Fabrications: Materials and requirements for fabricated metal supports.

B. Section 26 0533.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.

C. Section 26 0533.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.

D. Section 26 5100 - Interior Lighting: Additional support and attachment requirements for interior luminaires.

E. Section 26 5600 - Exterior Lighting: Additional support and attachment requirements for exterior luminaires.

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.

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; 2023.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

A. See Section 01 3000 - 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.

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.

1.05 QUALITY ASSURANCE

A. Maintain at project site one copy of each referenced document that prescribes execution requirements.

B. Installer Qualifications for Powder-Actuated Fasteners: Certified by fastener system manufacturer with current operator's license.

C. Installer Qualifications for Field Welding: See Section 05 5000.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 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. 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. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
   7. 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. 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.
   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. 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.
5. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch.
6. Minimum Channel Dimensions: 1-5/8 inch wide by 13/16 inch high.

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. Nonpenetrating Rooftop Supports for Low-Slope Roofs:
1. Manufacturers:
   a. Atkore International Inc; Unistrut: www.unistrut.us/#sle.
   b. Eaton Corporation: www.eaton.com/#sle.
   c. nVent; Caddy: www.nvent.com/#sle.
2. Description: Steel pedestals with thermoplastic or rubber bases that rest on top of roofing membrane, not requiring attachment to roof structure and not penetrating roofing assembly, with support fixtures as specified.
3. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
4. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
5. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.

G. 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.
2. Manufacturers - Powder-Actuated Fastening Systems:
   a. Dewalt: anchors.dewalt.com/#sle.
   b. Hilti, Inc: www.hilti.com/#sle.
   c. ITW Ramset, a division of Illinois Tool Works, Inc: www.ramset.com/#sle.
3. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.
4. 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.

5. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

PART 3 EXECUTION

3.01 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.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install hangers and supports in accordance with NECA 1.

C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

D. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

E. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

F. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

G. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

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. Conduit Support and Attachment: See Section 26 0533.13 for additional requirements.

J. Box Support and Attachment: See Section 26 0533.16 for additional requirements.

K. Interior Luminaire Support and Attachment: See Section 26 5100 for additional requirements.

L. Exterior Luminaire Support and Attachment: See Section 26 5600 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.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - 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 0533.13
CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).
B. Aluminum rigid metal conduit (RMC).
C. Galvanized steel intermediate metal conduit (IMC).
D. PVC-coated galvanized steel rigid metal conduit (RMC).
E. Flexible metal conduit (FMC).
F. Liquidtight flexible metal conduit (LFMC).
G. Galvanized steel electrical metallic tubing (EMT).
H. Stainless steel electrical metallic tubing (EMT).
I. Aluminum electrical metallic tubing (EMT).
J. Rigid polyvinyl chloride (PVC) conduit.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete encasement of conduits.
B. Section 07 8400 - Firestopping.
C. Section 26 0526 - Grounding and Bonding for Electrical Systems.
   1. Includes additional requirements for fittings for grounding and bonding.
D. Section 26 0529 - Hangers and Supports for Electrical Systems.
E. Section 26 0548 - Vibration and Seismic Controls for Electrical Systems.
F. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
G. Section 26 2100 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conduits.
H. Section 31 2316 - Excavation.
I. Section 31 2323 - Fill: Bedding and backfilling.

1.03 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2025.
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); 2025.
D. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit; 2025.
E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
F. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2020.
G. NECA 102 - Standard for Installing Aluminum Rigid Metal Conduit; 2004.
H. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2025.
I. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

J. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Metal Conduit and Intermediate Metal Conduit; 2018.

K. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2020.

L. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2021.

M. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

N. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.

O. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.

P. UL 6A - Electrical Rigid Metal Conduit-Aluminum, Red Brass, and Stainless Steel; Current Edition, Including All Revisions.

Q. UL 360 - Liquid-Tight Flexible Metal Conduit; Current Edition, Including All Revisions.

R. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

S. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.

T. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

U. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

V. UL 797A - Electrical Metallic Tubing - Aluminum and Stainless Steel; Current Edition, Including All Revisions.

W. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.

X. UL 2419 - Outline of Investigation for Electrically Conductive Corrosion Resistant Compounds; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - 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.
   2. Include proposed locations of roof penetrations and proposed methods for sealing.

D. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2-inch (53 mm) trade size and larger.

1.05 QUALITY ASSURANCE

A. Documents at Project Site: Maintain at project site one copy of manufacturer's instructions and shop drawings.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 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 rigid PVC conduit.
   3. Exterior, Embedded Within Concrete: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit (RMC), or rigid PVC conduit.
   4. Where rigid polyvinyl chloride (PVC) conduit is provided, transition to galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), aluminum electrical metallic tubing (EMT), or schedule 80 rigid PVC conduit where emerging from underground.
   5. Where rigid polyvinyl (PVC) conduit larger than 2-inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit (RMC) elbows, galvanized steel intermediate metal conduit (IMC) elbows, PVC-coated galvanized steel rigid metal conduit (RMC) elbows, or concrete-encased PVC elbows for bends.
   6. 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, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection.

D. Embedded Within Concrete:
   1. Within Slab on Grade: Not permitted.
   2. Within Slab Above Ground: Not permitted.
   3. Within Concrete Walls Above Ground: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), or rigid PVC conduit.
   4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or aluminum electrical metallic tubing (EMT) where emerging from concrete.
   5. Where galvanized steel electrical metallic tubing (EMT) emerges from concrete into salt air, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection for minimum of 4 inches on either side of where conduit emerges.
   6. Where aluminum rigid metal conduit (RMC) and aluminum electrical metallic tubing (EMT) is installed in concrete, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection.

E. Concealed Within Masonry Walls: Use galvanized steel electrical metallic tubing (EMT) or aluminum electrical metallic tubing (EMT).

F. Concealed Within Hollow Stud Walls: Use galvanized steel electrical metallic tubing (EMT) or aluminum electrical metallic tubing (EMT).

G. Concealed Above Accessible and Non-Accessible Ceilings: Use aluminum electrical metallic tubing (EMT).

H. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit (RMC) or galvanized steel intermediate metal conduit (IMC).

I. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel electrical metallic tubing (EMT) or aluminum electrical metallic tubing (EMT).

J. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC) or aluminum 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 galvanized steel intermediate metal conduit (IMC).

L. Exposed, Exterior, Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC) or galvanized steel intermediate metal conduit (IMC).

M. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit (RMC) or galvanized steel intermediate metal conduit (IMC).

N. Flexible Connections to Luminaires Above Accessible Ceilings only: Use flexible metal conduit (FMC).
   1. Maximum Length: 6 feet.

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.

2.02 CONDUIT - GENERAL REQUIREMENTS

A. Comply with NFPA 70.

B. Electrical Service Conduits: See Section 26 2100 for additional requirements.

C. Fittings for Grounding and Bonding: See Section 26 0526 for additional requirements.

D. Provide conduit, fittings, supports, and accessories required for complete raceway system.

E. Provide products listed, classified, and labeled as suitable for purpose intended.

F. 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. Flexible Connections to Luminaires: 3/8-inch trade size.
   5. Underground, Interior: 3/4-inch trade size.
   6. Underground, Exterior: 1-inch trade size.

G. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 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. Factory-Painted, Color-Coded Galvanized Steel RMC: Apply according to indicated color code.
1. See Section 26 0553 for color code.

D. Fittings:
1. Manufacturers:
a. ABB; T&B: www.electrification.us.abb.com/#sle.
b. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.us/#sle.
c. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
d. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.
2. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.
3. Material: Use steel or malleable iron.
a. Where not subject to severe corrosive influence, stainless steel or aluminum fittings may be used.
4. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.04 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. Manufacturers:
a. ABB; T&B: www.electrification.us.abb.com/#sle.
b. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.us/#sle.
c. Bridgeport Fittings, LLC: www.bptfittings.com/#sle.
d. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.
2. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6A.
3. Material: Use aluminum.
4. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.05 GALVANIZED STEEL INTERMEDIATE METAL CONDUIT (IMC)

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 IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

C. Fittings:
   1. Manufacturers:
      a. ABB; T&B: www.electrification.us.abb.com/#sle.
      b. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.us/#sle.
      c. Bridgeport Fittings, LLC: www.bptfittings.com/#sle.
      d. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.
   2. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.
   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.

2.06 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.

2.07 FLEXIBLE METAL CONDUIT (FMC)

A. Manufacturers:
   1. AFC Cable Systems, a division of Atkore International: www.afcweb.com/#sle.
   2. 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. Manufacturers:
      a. ABB; T&B: www.electrification.us.abb.com/#sle.
      b. Bridgeport Fittings, LLC: www.bptfittings.com/#sle.
      c. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.
   2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   3. Material: Use steel or malleable iron.

2.08 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. Manufacturers:
a. ABB; T&B: www.electrification.us.abb.com/#sle.
b. Bridgeport Fittings, LLC: www.bptfittings.com/#sle.
c. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.
2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use steel or malleable iron.

2.09 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. Factory-Painted, Color-Coded Galvanized Steel EMT: Apply according to indicated color code.
1. See Section 26 0553 for color code.
2. Products:
a. Rymco USA; Real Color: www.rymcousa.com/#sle.

D. Fittings:
1. Manufacturers:
a. ABB; T&B: www.electrification.us.abb.com/#sle.
b. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.us/#sle.
c. Bridgeport Fittings, LLC: www.bptfittings.com/#sle.
d. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.
2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use steel or malleable iron.
4. Connectors and Couplings: Use compression/gland type.
a. Do not use indenter type connectors and couplings.
b. Do not use set-screw type connectors and couplings.
5. Embedded Within Concrete, Where Permitted: Use fittings listed as concrete-tight. Fittings that require taping to be concrete-tight are acceptable.

2.10 STAINLESS STEEL ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT stainless steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797A.

B. Fittings:
1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Connectors and Couplings: Use compression/gland type.

a. Do not use set-screw type connectors and couplings.

2.11 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. Manufacturers:
a. Arlington Industries: www.aifittings.com/#sle.
b. Bridgeport Fittings, LLC: www.bptfittings.com/#sle.
2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B; listed for use with aluminum EMT.
3. Material: Use aluminum.
4. Connectors and Couplings: Use compression/gland type.
a. Do not use indenter type connectors and couplings.
b. Do not use set-screw type connectors and couplings.
5. Embedded Within Concrete, Where Permitted: Use fittings listed as concrete-tight. Fittings that require taping to be concrete-tight are acceptable.

2.12 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.

2.13 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. Foam Conduit Sealant:
1. Removable, two-part, closed-cell foam, specifically designed for sealing conduit openings against water, moisture, gases, and dust.
2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
3. Rated to hold minimum of 10 ft water head pressure.

4. Products:
    a. American Polywater Corporation; Polywater AFT Foam Duct Sealant: www.polywater.com/#sle.
    b. American Polywater Corporation; Polywater FST Foam Duct Sealant: www.polywater.com/#sle.

F. Conduit Mechanical Seals:
1. Listed as complying with UL 514B.
2. Specifically designed for sealing conduit openings against water, moisture, gases, and dust.
3. Suitable for sealing around conductors/cables to be installed.
4. Products:
    a. American Polywater Corporation; PHRD SG Mechanical Seals: www.polywater-haufftechnik.com/#sle.

G. 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.
3. Products:
    a. American Polywater Corporation; PZVR Cement-Coated Concrete Wall Sleeves: www.polywater-haufftechnik.com/#sle.
    b. American Polywater Corporation; PHSD Mechanical Seals: www.polywater-haufftechnik.com/#sle.
    c. American Polywater Corporation; PHSI 150 Varia Double Wall Inserts: www.polywater-haufftechnik.com/#sle.
    d. American Polywater Corporation; PGKD Modular Seals: www.polywater-haufftechnik.com/#sle.

H. 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.
1. Products:
    a. Alta Products, LLC; Sigrist Pipe Chase Housing, Curbs, and Exit Seals: www.altaproductsllc.com/#sle.
    b. Menzies Metal Products; Electrical Roof Stack and Cap: www.menzies-metal.com/#sle.
    c. Menzies Metal Products; Electrical Retro Box: www.menzies-metal.com/#sle.

I. 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.
1. Products:
    a. Quickflash Weatherproofing Products, Inc: www.quickflashproducts.com/#sle.

J. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.
1. Products:
    a. HoldRite, a brand of Reliance Worldwide Corporation; HydroFlame Pro Series/HydroFlame Custom Built: www.holdrite.com/#sle.

K. Duct Bank Spacers: Nonmetallic; designed for maintaining conduit/duct spacing for concrete encasement in open trench installation; suitable for conduit/duct arrangement to be installed.
1. Products:

a. Advance Products & Systems, LLC; Duct Bank Spacers: www.apsonline.com/#sle.

PART 3 EXECUTION

3.01 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.

3.02 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 intermediate metal conduit (IMC) in accordance with NECA 101.

F. Install PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by manufacturer.

G. Install rigid polyvinyl chloride (PVC) conduit 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 four 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 0529.
   2. Provide required vibration isolation and/or seismic controls; see Section 26 0548.
   3. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
   4. 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.
   5. 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.
   6. Use metal channel/strut with accessory conduit clamps to support multiple parallel surface-mounted conduits.
   7. Use conduit clamp to support single conduit from beam clamp or threaded rod.
   8. Use trapeze hangers assembled from threaded rods and metal channel/strut with accessory conduit clamps to support multiple parallel suspended conduits.
   9. Use nonpenetrating rooftop supports to support conduits routed across rooftops, where approved.
   10. Use of spring steel conduit clips for support of conduits is not permitted.
   11. Use of wire for support of conduits is not permitted.

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. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
   6. 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.

7. Provide metal escutcheon plates for conduit penetrations exposed to public view.
8. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 07 8400.

L. Underground Installation:
1. Provide trenching and backfilling; see Section 31 2316 and Section 31 2323.
2. Minimum Cover, Unless Otherwise Indicated or Required:
a. Underground, Exterior: 18 inches.
b. Under Slab on Grade: 12 inches to bottom of slab.
3. Provide underground warning tape along entire conduit length for service entrance where not concrete-encased; see Section 26 0553.

M. 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 3000.

N. 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.

O. 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.

P. 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.

Q. Provide grounding and bonding; see Section 26 0526.

R. Identify conduits; see Section 26 0553.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - 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.

3.04 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 0533.16
BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 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. Boxes and enclosures for integrated power, data, and audio/video.

D. Floor boxes.

E. Underground boxes/enclosures.

F. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete.

B. Section 08 3100 - Access Doors and Panels: Panels for maintaining access to concealed boxes.

C. Section 26 0529 - Hangers and Supports for Electrical Systems.

D. Section 26 0533.13 - 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 2726 - Wiring Devices:
   1. Wall plates.
   2. Floor box service fittings.
   3. Additional requirements for locating boxes for wiring devices.

F. Section 27 1000 - Structured Cabling: Additional requirements for communications systems outlet boxes.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

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; 2023.

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.

1.04 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.

1.05 SUBMITTALS

A. See Section 01 3000 - 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.

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 outlet and device boxes, pull boxes, cabinets and enclosures, floor boxes, and underground boxes/enclosures.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 6000 - Product Requirements, for additional provisions.
2. Keys for Lockable Enclosures: Two of each different key.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 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: Comply with Section 27 1000.
    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 2726.
14. Manufacturers:
    a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com/#sle.
    b. Hubbell Incorporated; Bell Products: www.hubbell-rtb.com/#sle.
    c. Hubbell Incorporated; RACO Products: www.hubbell-rtb.com/#sle.
    d. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
    e. Thomas & Betts Corporation: www.tnb.com/#sle.

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:
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.
    b. Back Panels: Painted steel, removable.
    c. Terminal Blocks: Provide voltage/current ratings and terminal quantity suitable for purpose indicated, with 25 percent spare terminal capacity.

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. Boxes and Enclosures for Integrated Power, Data, and Audio/Video: Size and configuration as indicated or as required with partitions to separate services; field-connected gangable boxes may be used.
1. Manufacturers:
   a. Hubbell Incorporated: www.hubbell.com/#sle.

E. Floor Boxes:
1. Description: Floor boxes compatible with floor box service fittings provided in accordance with Section 26 2726; with partitions to separate multiple services; furnished with all components, adapters, and trims required for complete installation.
2. Manufacturer: Same as manufacturer of floor box service fittings.

F. 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) MacLean Highline: www.macleanhighline.com/#sle.
      2) Oldcastle Precast, Inc: www.oldcastleprecast.com/#sle.
   b. Combination fiberglass/polymer concrete boxes/enclosures are acceptable.
   c. Product(s):
      1) MacLean Highline PHA Series: Straight wall, all-polymer concrete splice box/pull box; available Tier 8, Tier 15, and Tier 22 load ratings.
      2) MacLean Highline CHA Series: Fiberglass/polymer concrete splice box/pull box; available Tier 8 and Tier 15 load ratings.
      3) MacLean Highline CVA Series: Fiberglass/polymer concrete splice vault; available Tier 8, Tier 15, and Tier 22 load ratings.

2.02 ACCESSORIES

A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for boxes and facade materials to be installed.
1. Manufacturers:
   a. Quickflash Weatherproofing Products, Inc: www.quickflashproducts.com/#sle.

PART 3 EXECUTION

3.01 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.

3.02 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 3100 as required where approved by the Architect.
   2. Unless dimensioned, box locations indicated are approximate.
   3. Locate boxes as required for devices installed under other sections or by others.
      a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 26 2726.
      b. Communications Systems Outlets: Comply with Section 27 1000.
   4. Locate boxes so that wall plates do not span different building finishes.
   5. Locate boxes so that wall plates do not cross masonry joints.
   6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
   7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches horizontal separation unless otherwise indicated.
   8. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches horizontal separation.
   9. 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.
   10. 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 0533.13.
   11. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
      a. Concealed above accessible suspended ceilings.
      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 0529 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.

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 3 inch high concrete pad constructed in accordance with Section 03 3000.

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. Nonmetallic Floor Boxes: Cut box flush with finished floor after concrete pour.

O. Underground Boxes/Enclosures:
1. Install enclosure on gravel base, minimum 6 inches deep.
2. Mount enclosures located in landscaped areas with top at 1 inch above finished grade.
3. Provide cast-in-place concrete collar constructed in accordance with Section 03 3000, minimum 10 inches wide by 12 inches deep, around enclosures that are not located in concrete areas.
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.

P. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

Q. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

R. Close unused box openings.

S. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

T. Provide grounding and bonding in accordance with Section 26 0526.

3.03 CLEANING

A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.04 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 0548
VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Vibration isolation requirements.

B. Vibration-isolated equipment support bases.

C. Vibration isolators.

1.02 RELATED REQUIREMENTS

A. Section 01 4533 - Code-Required Special Inspections and Procedures.

B. Section 03 3000 - Cast-in-Place Concrete.

C. Section 26 0529 - Hangers and Supports for Electrical Systems.

1.03 REFERENCE STANDARDS

A. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate selection and arrangement of vibration isolation and/or seismic control components with the actual equipment 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. 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 3000.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Design Documents: Prepare and submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, details, and calculations.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.
   1. Vibration Isolators: Include rated load capacities and deflections; include information on color coding or other identification methods for spring element load capacities.

D. Shop Drawings - Vibration Isolation Systems:
   1. Include dimensioned plan views and sections indicating proposed arrangement of vibration isolators; indicate equipment weights and static deflections.

2. Vibration-Isolated Equipment Support Bases: Include base weights, including concrete fill where applicable; indicate equipment mounting provisions.

E. Field quality control test reports.

1.06 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Comply with applicable building code.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 VIBRATION ISOLATION REQUIREMENTS

A. Design and provide vibration isolation systems to reduce vibration transmission to supporting structure from vibration-producing electrical equipment and/or electrical connections to vibration-isolated equipment.

B. Comply with applicable general recommendations of ASHRAE (HVACA), where not in conflict with other specified requirements:

C. General Requirements:
1. Select vibration isolators to provide required static deflection.
2. Select vibration isolators for uniform deflection based on distributed operating weight of actual installed equipment.
3. Select vibration-isolated equipment support bases and associated vibration isolators to provide minimum 2-inch operating clearance beneath base unless otherwise indicated.

D. Equipment Isolation:
1. Transformers:
a. Specified vibration isolators are in addition to any factory-installed internal core and coil assembly vibration isolators unless otherwise indicated.
b. Floor-Mounted Transformers, Nonseismic Applications: Use resilent material isolator pads, resilient material isolator mounts, or open (unhoused) spring isolators.
c. Suspended Transformers, Nonseismic Applications: Use resilient material isolator hangers, spring isolator hangers, or combination resilient material/spring isolator hangers.
d. Wall-Mounted Transformers, Nonseismic Applications: Use resilient material isolator mounts.
e. Minimum Static Deflection:
1) Transformers Mounted on Grade-Level Slabs: 0.25 inch deflection unless otherwise indicated.
2) Transformers Mounted at Above-Grade Levels: 0.5 inch deflection unless otherwise indicated.
2. Engine Generators:
a. Specified vibration isolators are in addition to any factory-installed internal vibration isolators between generator set and integral base unless otherwise indicated; obtain generator set manufacturer approval of applied vibration isolation.
b. Nonseismic Applications, Isolators Not Located Below Sub-Base Fuel Tank: Use housed spring isolators or restrained spring isolators.
c. Nonseismic Applications, Isolators Located Below Sub-Base Fuel Tank: Use restrained spring isolators.
d. Minimum Static Deflection:

1) Generators Mounted on Grade-Level Slabs: 1 inch deflection unless otherwise indicated.

E. Conduit Isolation:
1. Use flexible conduit or cable for electrical connections to vibration-isolated equipment, including equipment installed under other sections or by others.
a. Minimum Length: 3 feet unless otherwise indicated.
2. Vibration Isolators:
a. Provide vibration isolators for conduit supports:
1) For conduits over 2 inch trade size located below or within 50 feet of noise-sensitive areas indicated.
b. Minimum Static Deflection:
1) First Three Supports Closest to Isolated Equipment: Same as static deflection of equipment; maximum of 2 inch deflection required.
c. Suspended Conduits, Nonseismic Applications: Use resilient material isolator hangers, spring isolator hangers, or combination resilient material/spring isolator hangers.
d. Use modular seal or approved resilient material where vibration-isolated conduits penetrate building elements (e.g., walls, floors) arranged to prevent vibration transmission to structure.

2.02 VIBRATION-ISOLATED EQUIPMENT SUPPORT BASES

A. Manufacturers:
1. Vibration-Isolated Equipment Support Bases:
a. Kinetics Noise Control, Inc: www.kineticsnoise.com/#sle.
b. Mason Industries: www.mason-ind.com/#sle.
c. Vibration Eliminator Company, Inc: www.veco-nyc.com/#sle.
2. Source Limitations: Furnish vibration-isolated equipment support bases and associated components and accessories produced by the same manufacturer as the vibration isolators and obtained from a single supplier.

B. Vibration-Isolated Structural Steel Bases:
1. Description: Engineered structural steel frames with integral mounting provisions for vibration isolators, sized and configured for mounting of equipment.

C. Vibration-Isolated Concrete Inertia Bases:
1. Description: Concrete-filled engineered steel forms with integral mounting provisions for vibration isolators, sized and configured for mounting of equipment.
2. Minimum Base Depth: 6 inches.
3. Minimum Base Mass (Including Concrete): 1.5 times weight of supported equipment.
4. Concrete Reinforcement: Welded or tied reinforcing bars running both ways in a single layer.
5. Concrete: Filled on site with minimum 3000 psi concrete in accordance with Section 03 3000.

2.03 VIBRATION ISOLATORS

A. Manufacturers:
1. Vibration Isolators:
a. Kinetics Noise Control, Inc: www.kineticsnoise.com/#sle.
b. Mason Industries: www.mason-ind.com/#sle.
c. Vibration Eliminator Company, Inc: www.veco-nyc.com/#sle.
2. Source Limitations: Furnish vibration-isolators and associated accessories produced by a single manufacturer and obtained from a single supplier.

B. General Requirements:
   1. Resilient Materials for Vibration Isolators: Oil, ozone, and oxidant resistant.
   2. Spring Elements for Spring Isolators:
      a. Color code or otherwise identify springs to indicate load capacity.
      b. Lateral Stability: Minimum lateral stiffness to vertical stiffness ratio of 0.8.
      c. Designed to operate in the linear portion of their load versus deflection curve over deflection range of not less than 50 percent above specified deflection.
      d. Designed to provide additional travel to solid of not less than 50 percent of rated deflection at rated load.
      e. Selected to provide designed deflection of not less than 75 percent of specified deflection.
      f. Selected to function without undue stress or overloading.

C. Vibration Isolators for Nonseismic Applications:
   1. Resilient Material Isolator Pads:
      a. Description: Single or multiple layer pads utilizing elastomeric (e.g., neoprene, rubber) or fiberglass isolator material.
      b. Pad Thickness: As required for specified minimum static deflection; minimum 0.25 inch thickness.
      c. Multiple Layer Pads: Provide bonded, galvanized sheet metal separation plate between each layer.
   2. Resilient Material Isolator Mounts, Nonseismic:
      a. Description: Mounting assemblies for bolting equipment to supporting structure utilizing elastomeric (e.g., neoprene, rubber) or fiberglass isolator material; fail-safe type.
   3. Open (Unhoused) Spring Isolators:
      a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) without a housing.
      b. Bottom Load Plate: Nonskid, molded, elastomeric isolator material or steel with nonskid elastomeric isolator pad with provisions for bolting to supporting structure as required.
      c. Furnished with integral leveling device for positioning and securing supported equipment.
   4. Housed Spring Isolators:
      a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) within a metal housing.
      b. Furnished with integral elastomeric snubbing elements, nonadjustable type, for limiting equipment movement and preventing metal-to-metal contact between housing elements.
      c. Bottom Load Plate: Steel with nonskid, elastomeric isolator pad with provisions for bolting to supporting structure as required.
      d. Furnished with integral leveling device for positioning and securing supported equipment.
   5. Restrained Spring Isolators, Nonseismic:
      a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) within a metal housing designed to prevent movement of supported equipment above an adjustable vertical limit stop.
      b. Bottom Load Plate: Steel with nonskid, elastomeric isolator pad with provisions for bolting to supporting structure as required.
      c. Furnished with integral leveling device for positioning and securing supported equipment.

d. Provides constant free and operating height.

6. Resilient Material Isolator Hangers, Nonseismic:
   a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing elastomeric (e.g., neoprene, rubber) or fiberglass isolator material for the lower hanger rod connection.
7. Spring Isolator Hangers, Nonseismic:
   a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) in series with an elastomeric element for the lower hanger rod connection.
   b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.
8. Combination Resilient Material/Spring Isolator Hangers, Nonseismic:
   a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) for the lower hanger rod connection and elastomeric (e.g., neoprene, rubber) or fiberglass isolator material for the upper hanger rod connection.
   b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 CODE-REQUIRED SPECIAL INSPECTIONS

A. Arrange work to accommodate tests and/or inspections performed by Special Inspection Agency employed by Owner or Architect in accordance with Section 01 4533 and statement of special inspections as required by applicable building code.

B. Frequency of Special Inspections: Where special inspections are designated as continuous or periodic, arrange work accordingly.
   1. Continuous Special Inspections: Special Inspection Agency to be present in the area where the work is being performed and observe the work at all times the work is in progress.
   2. Periodic Special Inspections: Special Inspection Agency to be present in the area where work is being performed and observe the work part-time or intermittently and at the completion of the work.

C. Prior to starting work, Contractor to submit written statement of responsibility to authorities having jurisdiction and to Owner acknowledging awareness of special requirements contained in the statement of special inspections.

D. Special Inspection Agency services do not relieve Contractor from performing inspections and testing specified elsewhere.

3.03 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install products in accordance with applicable requirements of NECA 1 (general workmanship).

C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

D. Secure fasteners according to manufacturer's recommended torque settings.

E. Install flexible conduit and cable connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

F. Vibration Isolation Systems:
   1. Vibration-Isolated Equipment Support Bases:
      a. Provide specified minimum clearance beneath base.
   2. Spring Isolators:
      a. Position equipment at operating height; provide temporary blocking as required.
      b. Lift equipment free of isolators prior to lateral repositioning to avoid damage to isolators.
      c. Level equipment by adjusting isolators gradually in sequence to raise equipment uniformly such that excessive weight or stress is not placed on any single isolator.
   3. Isolator Hangers:
      a. Use precompressed isolator hangers where required to facilitate installation and prevent damage to equipment utility connection provisions.
      b. Locate isolator hangers at top of hanger rods in accordance with manufacturer's instructions.
   4. Clean debris from beneath vibration-isolated equipment that could cause short-circuiting of isolation.
   5. Use elastomeric grommets for attachments where required to prevent short-circuiting of isolation.
   6. Adjust isolators to be free of isolation short circuits during normal operation.
   7. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect vibration isolation and/or seismic control components for damage and defects.

C. Vibration Isolation Systems:
   1. Verify isolator static deflections.
   2. Verify required clearance beneath vibration-isolated equipment support bases.
   3. Verify vibration isolation performance during normal operation; investigate sources of isolation short circuits.

D. Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control components.

E. Submit detailed reports indicating inspection and testing results and corrective actions taken.

END OF SECTION

SECTION 26 0553
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 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.

1.02 RELATED REQUIREMENTS

A. Section 09 9113 - Exterior Painting.

B. Section 09 9123 - Interior Painting.

C. Section 26 0519 - 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 0573 - Power System Studies: Arc flash hazard warning labels.

E. Section 26 2726 - Wiring Devices - Lutron: Device and wallplate finishes; factory pre-marked wallplates.

F. Section 27 1000 - Structured Cabling: Identification for communications cabling and devices.

1.03 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.

1.04 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.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

C. Shop Drawings: Provide schedule of items to be identified indicating proposed designations, materials, legends, and formats.

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.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.07 FIELD CONDITIONS

A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 PRODUCTS

2.01 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) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.
         5) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
         6) 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.
         4) Identify load(s) served. 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. Enclosed Contactors:
         1) Identify ampere rating.
         2) Identify voltage and phase.
         3) Identify configuration, e.g., E.O.E.H. (electrically operated, electrically held) or E.O.M.H. (electrically operated, mechanically held).
         4) Identify coil voltage.
         5) Identify load(s) and associated circuits controlled. 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.
h. Electricity Meters:
   1) Identify load(s) metered.

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 or voltage marker 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 voltage marker to identify highest voltage present for each piece of electrical equipment.
5. Use identification nameplate to identify switchboards and panelboards utilizing a high leg delta system in accordance with NFPA 70.
6. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.
7. 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.
8. 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.
9. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".
10. 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 9123 and 09 9113.
11. 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.
12. Arc Flash Hazard Warning Labels: Comply with Section 26 0573.
13. Use warning signs to identify electrical hazards for entrances to all rooms and other guarded locations that contain exposed live parts operating at 600 V nominal or less with

the word message "DANGER; Electrical hazard; Authorized personnel only" or approved equivalent.

B. Identification for Conductors and Cables:
   1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 0519.
   2. Use identification nameplate or 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. At each source and load connection.
      b. Within boxes when more than one circuit is present.
      c. Within equipment enclosures when conductors and cables enter or leave the enclosure.
   4. Use wire and cable markers to identify connected grounding electrode system components for grounding electrode conductors.
   5. Use underground warning tape to identify direct buried cables.

C. Identification for Raceways:
   1. Use voltage markers to identify highest voltage present for accessible conduits at maximum intervals of 20 feet.
   2. Use voltage markers, 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 9123 and 09 9113.
         2) Vinyl Color Coding Electrical Tape: Comply with Section 26 0519.
      c. Color Code:
         1) Emergency Power System: Red.
         2) Fire Alarm System: Red.
   3. 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.
   4. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify spare conduits at each end. Identify purpose and termination location.
   5. Use underground warning tape to identify underground raceways.
   6. Use voltage markers to identify highest voltage present for wireways at maximum intervals of 20 feet.

D. Identification for Boxes:
   1. Use voltage markers to identify highest voltage present.
   2. 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 9123 and 09 9113 per the same color code used for raceways.
      b. For exposed boxes in public areas, do not color code.
   3. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.
      a. For exposed boxes in public areas, use only identification labels.

4. Use warning labels to identify electrical hazards for boxes containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".

E. Identification for Devices:
   1. Identification for Communications Devices: Comply with Section 27 1000.
   2. Wiring Device and Wallplate Finishes: Comply with Section 26 2726.
   3. Factory Pre-Marked Wallplates: Comply with Section 26 2726.
   4. 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.
   5. Use identification label or engraved wallplate to identify serving branch circuit for all receptacles.
      a. For receptacles in areas as directed by Architect, provide identification on inside surface of wallplate.
   6. Use identification label or engraved wallplate to identify load controlled for wall-mounted control devices controlling loads that are not visible from the control location and for multiple wall-mounted control devices installed at one location.
   7. Use identification label to identify receptacles protected by upstream GFI protection, where permitted.

F. Identification for Luminaires:
   1. Use permanent red dot on luminaire frame to identify luminaires connected to emergency power system.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:
   1. Manufacturers:
      a. Brimar Industries, Inc: www.brimar.com/#sle.
      b. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.
      c. Seton Identification Products: www.seton.com/#sle.
   2. Materials:
      a. Indoor Clean, Dry Locations: Use plastic nameplates.
      b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
   3. 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.
   4. Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.
   5. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch; engraved or laser-etched text.
   6. 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. Manufacturers:
      a. Brady Corporation: www.bradyid.com/#sle.
      b. Brother International Corporation: www.brother-usa.com/#sle.
      c. Panduit Corp: www.panduit.com/#sle.
   2. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
   3. 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. System designation where applicable:
         1) Emergency Power System: Identify with text "EMERGENCY".
         2) Fire Alarm System: Identify with text "FIRE ALARM".
      b. Equipment designation or other approved description.
   3. Text: All capitalized unless otherwise indicated.
   4. Minimum Text Height:
      a. System Designation: 1 inch.
      b. Equipment Designation: 1/2 inch.
   5. Color:
      a. Normal Power System: White text on black background.
      b. Emergency Power System: White text on red background.
      c. Fire Alarm System: White text on red background.

D. Format for General Information and Operating Instructions:
   1. Minimum Size: 1 inch by 2.5 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.
      a. Exceptions:
         1) Provide white text on red background for general information or operational instructions for emergency systems.
         2) Provide white text on red background for general information or operational instructions for fire alarm systems.

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.

G. Format for Control Device Identification:
   1. Minimum Size: 3/8 inch by 1.5 inches.
   2. Legend: Load controlled 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.

H. Format for Fire Alarm Device Identification:
   1. Minimum Size: 3/8 inch by 1.5 inches.
   2. Legend: Designation indicated and device zone or address.

3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch.
5. Color: Red text on white background.

2.03 WIRE AND CABLE MARKERS

A. Manufacturers:
1. Brady Corporation: www.bradyid.com/#sle.
2. HellermannTyton: www.hellermanntyton.com/#sle.
3. Panduit Corp: www.panduit.com/#sle.

B. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.

C. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.

D. Legend: Power source and circuit number or other designation indicated.

E. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.

F. Minimum Text Height: 1/8 inch.

G. Color: Black text on white background unless otherwise indicated.

2.04 VOLTAGE MARKERS

A. Manufacturers:
1. Brady Corporation: www.bradyid.com/#sle.
2. Brimar Industries, Inc: www.brimar.com/#sle.
3. Seton Identification Products: www.seton.com/#sle.

B. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.

C. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.

D. Minimum Size:
1. Markers for Equipment: 1 1/8 by 4 1/2 inches.
2. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.
3. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches.
4. Markers for Junction Boxes: 1/2 by 2 1/4 inches.

E. Legend:
1. Markers for Voltage Identification: Highest voltage present.
2. Markers for System Identification:
a. Emergency Power System: Text "EMERGENCY".

F. Color: Black text on orange background unless otherwise indicated.

2.05 UNDERGROUND WARNING TAPE

A. Manufacturers:
1. Brady Corporation: www.bradyid.com/#sle.
2. Brimar Industries, Inc: www.brimar.com/#sle.
3. Seton Identification Products: www.seton.com/#sle.

B. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.

C. Non-detectable Type Tape: 6 inches wide, with minimum thickness of 4 mil.

D. Foil-backed Detectable Type Tape: 3 inches wide, with minimum thickness of 5 mil, unless otherwise required for proper detection.

E. Legend: Type of service, continuously repeated over full length of tape.

F. Color:

2.06 FLOOR MARKING TAPE

A. Manufacturers:
1. Brady Corporation: www.bradyid.com/#sle.
2. Brimar Industries, Inc: www.brimar.com/#sle.
3. Insite Solutions, LLC: www.stop-painting.com/#sle.
4. Seton Identification Products: www.seton.com/#sle.

B. 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.

2.07 WARNING SIGNS AND LABELS

A. Manufacturers:
1. Brimar Industries, Inc: www.brimar.com/#sle.
2. Clarion Safety Systems, LLC: www.clarionsafety.com/#sle.
3. Insite Solutions, LLC: www.stop-painting.com/#sle.
4. Seton Identification Products: www.seton.com/#sle.

B. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

C. Warning Signs:
1. Materials:
a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
3. Minimum Size: 7 by 10 inches unless otherwise indicated.

D. 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.

E. Floor Signs:
1. Materials: Use factory preprinted, self-adhesive vinyl, polyester, or rubber labels with protective overlaminate; removable.
2. Minimum Size: 17-inch diameter unless otherwise indicated.

PART 3 EXECUTION

3.01 PREPARATION

A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.02 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 one tape per trench at 3 inches below finished grade.

G. Secure rigid signs using stainless steel screws.

H. Mark all handwritten text, where permitted, to be neat and legible.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - 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 0573
POWER SYSTEM STUDIES

PART 1 GENERAL

1.01 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.

1.02 RELATED REQUIREMENTS

A. Section 26 0553 - Identification for Electrical Systems: Additional requirements for arc flash hazard warning labels.

B. Section 26 2100 - Low-Voltage Electrical Service Entrance.
   1. Includes Utility Company contact information.

C. Section 26 2413 - Switchboards.

D. Section 26 2416 - Panelboards.

E. Section 26 2816.13 - Enclosed Circuit Breakers.

F. Section 26 3533.16 - Low-Voltage Power Factor Correction Equipment.

1.03 REFERENCE STANDARDS

A. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2023.

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; 2025.

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.

1.04 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.
   3. Verify naming convention for equipment identification prior to creation of final drawings, reports, and arc flash hazard warning labels (where applicable).

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Study preparer's qualifications.

C. Field testing agency's qualifications.

D. Study reports, stamped or sealed and signed by study preparer.

E. Product Data: In addition to submittal requirements specified in other sections, include manufacturer's standard catalog pages and data sheets for equipment and protective devices indicating information relevant to studies.
   1. Include characteristic time-current trip curves for protective devices.
   2. Include impedance data for busway.
   3. Include impedance data for engine generators.
   4. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
   5. Identify modifications made in accordance with studies that:
      a. Can be made at no additional cost to Owner.
      b. As submitted will involve a change to the contract sum.

F. Arc Flash Hazard Warning Label Samples: One of each type and legend specified.

G. Site-specific arc flash hazard warning labels.

H. Field quality control reports.

I. Certification that field adjustable protective devices have been set in accordance with requirements of studies.

J. 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.

1.06 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 2100 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 full selective coordination.

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.
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.

1.07 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 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. EasyPower LLC: www.easypower.com/#sle.
      b. ETAP/Operation Technology, Inc: www.etap.com/#sle.
      c. SKM Systems Analysis, Inc: www.skm.com/#sle.

PART 2 PRODUCTS

2.01 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 0553.
   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) Site-specific PPE (personnel protective equipment) requirements.
         4) Nominal system voltage.
         5) Equipment identification.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install arc flash warning labels in accordance with Section 26 0553.

3.02 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Adjust equipment and protective devices for compliance with studies and recommended settings.

D. Notify Architect of any conflicts with or deviations from studies. Obtain direction before proceeding.

E. Submit detailed reports indicating inspection and testing results, and final adjusted settings.

3.03 CLOSEOUT ACTIVITIES

A. Training: Include as part of the base bid training for Owner's personnel on electrical safety pertaining to arc flash and shock hazards.
   1. Use site-specific arc flash and shock risk assessment report as training reference, supplemented with additional training materials as required.
   2. Provide minimum of eight hours of training.
   3. Instructor: Representative of entity performing study.

END OF SECTION

SECTION 26 0583
WIRING CONNECTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical connections to equipment.

1.02 RELATED REQUIREMENTS

A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables.

B. Section 26 0533.13 - Conduit for Electrical Systems.

C. Section 26 0533.16 - Boxes for Electrical Systems.

D. Section 26 2726 - Wiring Devices.

E. Section 26 2816.16 - Enclosed Switches.

1.03 REFERENCE STANDARDS

A. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).

B. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2021.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
   2. Determine connection locations and requirements.

B. Sequencing:
   1. Install rough-in of electrical connections before installation of equipment is required.
   2. Make electrical connections before required start-up of equipment.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide wiring device manufacturer’s catalog information showing dimensions, configurations, and construction.

C. 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.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.01 MATERIALS

A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
   1. Colors: Comply with NEMA WD 1.

2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

B. Disconnect Switches: As specified in Section 26 2816.16 and in individual equipment sections.

C. Wiring Devices: As specified in Section 26 2726.

D. Flexible Conduit: As specified in Section 26 0533.13.

E. Wire and Cable: As specified in Section 26 0519.

F. Boxes: As specified in Section 26 0533.16.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.02 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.

C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.

D. Provide receptacle outlet to accommodate connection with attachment plug.

E. Provide cord and cap where field-supplied attachment plug is required.

F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.

H. Install terminal block jumpers to complete equipment wiring requirements.

I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

J. Coolers and Freezers: Cut and seal conduit openings in freezer and cooler walls, floor, and ceilings.

END OF SECTION

SECTION 26 0800
ELECTRICAL SYSTEMS COMMISSIONING

GENERAL

1.01 DESCRIPTION

A. Commissioning
   1. Commissioning is a systematic process of ensuring that all building systems perform interactively according to the design intent and the owner's operational needs. Commissioning during the construction phase is intended to achieve the following specific objectives according to the Contract Documents:
      a. Verify that applicable equipment and systems are installed according to the manufacturer's recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by installing contractors.
      b. Verify and document proper performance of equipment and systems.
      c. Verify that Systems O&M documentation is complete.

B. The systems to be commissioned include (if included in project): emergency power systems, UPS Systems, and electrical and lighting controls.

C. Commissioning requires the participation of affected Division contractors to ensure that all systems are operating in a manner consistent with the Contract Documents. All affected Division contractors shall be familiar with all parts of the commissioning plan issued by the CA (Commissioning Authority) and shall execute all commissioning responsibilities assigned to them in the Contract Documents.

D. Commissioning Team: The members of the commissioning team consist of the Commissioning Authority (CA), the designated representative of the owner, the General Contractor (GC or Contractor), the Architect and Design Engineers, the Mechanical Contractor (MC), the Electrical Contractor (EC), the Controls Contractor (CC), the Fire Alarm Contractor, and any other installing subcontractors or suppliers of equipment. The Owner's building or plant operator/engineer is also a member of the commissioning team.

1.02 COMMISSIONING AUTHORITY

A. The commissioning authority and/or agency shall be selected and employed by the building owner. The commissioning agent shall be a registered design professional with experience in the commissioning of mechanical and electrical systems of the type installed in this project. Experience in construction process, direct digital control systems, test and balance and current edition ASHRAE Guideline 0 is mandatory. The commissioning agent shall not be associated with or employed by a mechanical contractor, or equipment supplier.

1.03 COMMISSIONING PLAN

A. Commissioning Plan
   1. The commissioning plan provides guidance in the execution of the commissioning process. Just after the initial commissioning scoping meeting the CA will provide the plan, which will continue to evolve and expand as the project progresses. The Specifications will take precedence over the Commissioning Plan.

B. Commissioning Process
   1. The following narrative provides a brief overview of the typical commissioning tasks during construction and the general order in which they occur.
      a. Commissioning during construction begins with a scoping meeting conducted by the CA where the commissioning process is reviewed with the commissioning team members.
      b. Additional meetings will be required throughout construction, scheduled by the CA with necessary parties attending, to plan, scope, coordinate, schedule future activities

and resolve problems. Generally, these meetings will be included with or will be sequential with regular subcontractor meetings.

c. Equipment documentation is submitted to the CA during normal submittals, including detailed start-up procedures.
d. The CA works with the Subs in developing startup plans and startup documentation formats, including verification checklists to be completed, during the startup process.
e. In general, the checkout and performance verification proceeds from simple to complex; from component level to equipment to systems and intersystem levels with pre-functional checklists being completed before functional testing.
f. The Subcontractors, under their own direction, execute and document the pre-functional checklists and perform startup and initial checkout. The CA documents that the checklists and startup were completed according to the approved plans. This may include the CA witnessing start-up of selected equipment and systems.
g. The installing contractors, suppliers and manufacturers, develop specific equipment and system functional performance test procedures with the assistance of the CA.
h. The procedures are executed by the Subcontractors, under the direction of, and documented by the CA.
i. Items of non-compliance in material, installation or setup are corrected at the Subcontractor's expense and the system retested.
j. The CA reviews the Systems/O&M documentation for completeness. All Systems/O&M documentation must be submitted and approved before the start of training.
k. Commissioning shall be completed before Substantial Completion.
l. Deferred testing is conducted, as specified or required.

1.04 RESPONSIBILITIES

A. All Contractors, Subcontractors, and all other Commissioning team members will be required to coordinate and remedy all deficiencies in their area of responsibility defined in this section.

B. General Contractor (GC)
   1. General Responsibilities
      a. Facilitate the coordination of the commissioning work by the CA, and with the CA ensure that commissioning activities are being scheduled into the master schedule.
      b. Furnish a copy of all construction documents, addenda, change orders and approved submittals and shop drawings related to commissioned equipment to the CA.
      c. In each purchase order or subcontract written, include requirements for submittal data, Systems/O&M data, commissioning tasks and training.
      d. Ensure that all Subs execute their commissioning responsibilities according to the Contract Documents and schedule.
      e. A representative shall attend a commissioning scoping meeting and other necessary meetings scheduled by the CA to facilitate the Commissioning process.
      f. Prepare Systems/O&M manuals, according to the Contract Documents, including clarifying and updating the original sequences of operation to record conditions.
   2. Warranty Period
      a. Ensure that Subcontractors execute seasonal or deferred functional performance testing, witnessed by the CA, according to the specifications.
      b. Ensure that Subs correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

C. Electrical Contractors and Sub-Contractors
   1. The commissioning responsibilities applicable to each of the subcontractors are generally as follows (all references apply to commissioned equipment only). Specific requirements are shown in the appropriate Divisions.

2. Construction and Acceptance Phases
    a. In each purchase order or subcontract written, include requirements for submittal data, commissioning documentation, Systems/O&M data and training.
    b. Attend a commissioning scoping meeting and other meetings necessary to facilitate the Commissioning process.
    c. Contractors shall provide the CA with normal cut sheets and shop drawing submittals of commissioned equipment as part of the normal submittal process.
    d. Provide additional requested documentation, prior to normal Systems/O&M manual submittals, to the CA for development of start-up and functional testing procedures.
    e. Typically this will include detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures, full details of any owner-contracted tests, full factory testing reports, if any, and full warranty information, including all responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation, start-up and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the Commissioning Authority.
    f. The Commissioning Authority may request further documentation necessary for the commissioning process.
    g. Provide a copy of the Systems/O&M manuals and submittals of commissioned equipment, through normal channels, to the CA for review and approval.
    h. Contractors shall assist (along with the design engineers) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
    i. Prepare the specific functional performance test procedures for review by the CA. Subs shall review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.
    j. Address current A/E punch list items before functional testing
    k. Provide skilled technicians to execute starting of equipment and to execute the functional performance tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem solving.
    l. Perform functional performance testing under the direction of the CA for specified equipment. Assist the CA in interpreting the monitoring data, as necessary.
    m. Correct deficiencies (differences between specified and observed performance) as interpreted by the CA, and A/E and retest the equipment.
    n. Prepare Systems/O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.
    o. Prepare redline record drawings for all drawings and final record drawings for contractor-generated coordination drawings.
    p. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.
3. Warranty Period
    a. Execute seasonal or deferred functional performance testing, witnessed by the CA, according to the specifications.
    b. Correct deficiencies and make necessary adjustments to Systems/O&M manuals and record drawings for applicable issues identified in any seasonal testing.

D. Equipment Suppliers
1. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner to keep warranties in force.
2. Assist in equipment testing per agreements with Subs.

3. Include all special tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment according to these Contract Documents in the base bid price to the Contractor, except for stand-alone data logging equipment that may be used by the CA.
4. Provide information requested by CA regarding equipment sequence of operation and testing procedures.
5. Review test procedures for equipment installed by factory representatives.

E. Commissioning Authority (CA)
1. The CA is not responsible for design concept, design criteria, compliance with codes, design or general construction scheduling, cost estimating, or construction management. The CA may assist with problem-solving non-conformance or deficiencies, but ultimately that responsibility resides with the general contractor and the A/E. The primary role of the CA is to develop and coordinate the execution of a testing plan, observe and document performance-which systems are functioning in accordance with the documented design intent and in accordance with the Contract Documents. The Contractors will provide all tools or the use of tools to start, checkout and functionally test equipment and systems, except for specified testing equipment supplied and installed by the CA.
    a. Coordinates and directs the commissioning activities in a logical, sequential and efficient manner using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties, frequently updated timelines and schedules and technical expertise.
    b. Coordinate the commissioning work and, with the GC, ensure that commissioning activities are being scheduled into the master schedule.
    c. Revise, as necessary, Commissioning Plan-Construction Phase.
    d. Plan and conduct a commissioning scoping meeting.
    e. Request and review additional information required to perform commissioning tasks, including Systems/O&M materials, contractor start-up and checkout procedures.
    f. Before startup, gather and review the current control sequences and interlocks and work with contractors and design engineers until sufficient clarity has been obtained, in writing, to be able to write detailed testing procedures.
    g. Review and approve normal Contractor submittals applicable to systems being commissioned for compliance with commissioning needs, along with A/E reviews.
    h. Perform site visits, as necessary, to observe component and system installations. Attend selected planning and job-site meetings to obtain information on construction progress. Review construction-meeting minutes for revisions/substitutions relating to the commissioning process. Assist in resolving any discrepancies.
    i. Approve systems start-up by reviewing start-up reports and by selected site observation.
    j. Review the functional performance test procedures for equipment and systems developed by the subcontractors and suppliers. This may include energy management control system trending, or manual functional testing.
    k. Coordinate, witness and approve manual functional performance tests performed by installing contractors. Coordinate retesting as necessary until satisfactory performance is achieved.
    l. Compile and maintain a commissioning record.
    m. Review and approve the preparation of the Systems/O&M manuals.
    n. Provide a final commissioning report.
2. Warranty Period
    a. Coordinate and supervise required seasonal or deferred testing and deficiency corrections.

b. Return to the site at 10 months into the 12-month warranty period and review with facility staff the current building operation and the condition of outstanding issues. Also interview facility staff and identify problems or concerns they have operating the building as originally intended. Make suggestions for improvements and for recording these changes in the Systems/O&M manuals. Identify areas that may come under warranty or under the original construction contract. Assist facility staff in developing reports, documents and requests for services to remedy outstanding problems.

1.05 SCHEDULING

A. The CA will work with the GC according to established protocols to schedule the commissioning activities. The CA will provide sufficient notice to the CM and GC for scheduling commissioning activities. The GC will integrate all commissioning activities into the master schedule. All parties will address scheduling problems and make necessary notifications in a timely manner in order to expedite the commissioning process.

PRODUCTS

2.01 TEST EQUIPMENT

A. All standard testing equipment required to perform startup and initial checkout and required functional performance testing shall be provided by the Division contractor for the equipment being tested.

B. Special equipment, tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment, according to these Contract Documents shall be included in the base bid price to the Contractor and left on site.

C. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications.

EXECUTION

3.01 MEETINGS

A. Scoping Meeting
   1. Within 60 days of commencement of construction or after all subcontractors have been selected, the CA will schedule, plan and conduct a commissioning scoping meeting with the entire commissioning team in attendance. Meeting minutes will be distributed to all parties by the GC. Information gathered from this meeting will allow the CA to revise the Commissioning Plan to its “final” version, which will also be distributed to all parties.

B. Miscellaneous Meetings
   1. Other meetings will be planned and conducted by the CA as construction progresses. These meetings will cover coordination, deficiency resolution and planning issues with particular Subs. The CA will plan these meetings and will minimize unnecessary time being spent by Subs.

3.02 REPORTING

A. The CA will regularly communicate with all members of the commissioning team, keeping them apprised of commissioning progress and scheduling changes through memos, progress reports, etc.

B. Testing or review approvals and non-conformance and deficiency reports are made regularly with the review and testing as described in later sections.

C. A final summary report by the CA will be provided focusing on evaluating commissioning process issues and identifying areas where the process could be improved. All acquired documentation, logs, minutes, reports, deficiency lists, communications, findings, unresolved issues, etc., will be compiled in appendices and provided with the summary report.

3.03 SUBMITTALS

THE CA WILL PROVIDE APPROPRIATE CONTRACTORS WITH A SPECIFIC REQUEST FOR THE TYPE OF SUBMITTAL DOCUMENTATION THE CA REQUIRES TO FACILITATE THE COMMISSIONING WORK. THESE REQUESTS WILL FOLLOW THE NORMAL SUBMITTAL PROCESS AND PROTOCOL. AT MINIMUM, THE REQUEST WILL INCLUDE THE MANUFACTURER AND MODEL NUMBER, THE MANUFACTURER'S PRINTED INSTALLATION AND DETAILED START-UP PROCEDURES, FULL SEQUENCES OF OPERATION, O&M DATA, PERFORMANCE DATA, ANY PERFORMANCE TEST PROCEDURES, CONTROL DRAWINGS AND DETAILS OF OWNER CONTRACTED TESTS. IN ADDITION, THE INSTALLATION AND CHECKOUT MATERIALS THAT ARE ACTUALLY SHIPPED INSIDE THE EQUIPMENT AND THE ACTUAL FIELD CHECKOUT SHEET FORMS TO BE USED BY THE FACTORY OR FIELD TECHNICIANS SHALL BE SUBMITTED TO THE COMMISSIONING AUTHORITY. ALL DOCUMENTATION REQUESTED BY THE CA WILL BE INCLUDED BY THE SUBS IN THEIR SYSTEMS/O&M MANUAL CONTRIBUTIONS.

A. The CA may request additional design narrative from the A/E and Controls Contractor, depending on the completeness of the design intent documentation and sequences provided with the Specifications.

4.02 FUNCTIONAL TESTING

A. This sub-section applies to all commissioning functional testing for all divisions.

B. Objectives and Scope
   1. The objective of functional testing is to demonstrate that each system is operating according to the documented design intent and Contract Documents. Functional testing facilitates bringing the systems from a state of substantial completion to full dynamic operation. Additionally, during the testing process, areas of deficient performance are identified and corrected, improving the operation and functioning of the systems.
   2. In general, each system should be operated through all modes of operation where there is a specified system response. Verifying each sequence in the sequences of operation is required.

C. Development of Test Procedures
   1. Before test procedures are written, the CA shall obtain all requested documentation and a current list of change orders affecting equipment or systems, including an updated points list, program code, control sequences and parameters. Each Sub or vendor responsible to execute a test shall provide assistance to the CA in developing the procedures review (answering questions about equipment, operation, sequences, etc.). Prior to execution, the Sub(s) shall review the tests for feasibility, safety, equipment and warranty protection. The CA may submit the tests to the A/E for review, if requested.
   2. The purpose of any given specific test is to verify and document compliance with the stated criteria of acceptance given on the test form.

D. Test Methods
   1. Functional testing and verification may be achieved by manual testing (persons manipulate the equipment and observe performance) or by monitoring the performance and analyzing the results. The CA will determine which method is most appropriate for tests that do not have a method specified.

E. Coordination and Scheduling
   1. The Subs shall provide sufficient notice to the CA regarding their completion schedule for the pre-functional checklists and startup of all equipment and systems. The CA will schedule functional tests through the GC and affected Subcontractors. The CA shall direct, witness and document the functional testing of all equipment and systems. The Subs shall execute the tests.

2. In general, functional testing is conducted after pre-functional testing and startup has been satisfactorily completed. Testing proceeds from components to subsystems to systems. When the proper performance of all interacting individual systems has been achieved, the interface or coordinated responses between systems is checked.

4.03 DOCUMENTATION, NON-CONFORMANCE AND APPROVAL OF TESTS

A. Documentation
   1. The CA shall witness and document the results of all functional tests using the specific procedural forms developed for that purpose. Prior to testing, these forms are provided to the GC for review and approval and to the Subs for review. The CA will include the filled out forms in the Commissioning Report.

B. Non-Conformance
   1. The CA will record the results of the functional test on the procedure or test form. All deficiencies or non-conformance issues shall be noted and reported on a standard non-compliance form.
   2. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CA. In such cases the deficiency and resolution will be documented on the procedure form.
   3. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures.
   4. As tests progress and a deficiency is identified, the CA discusses the issue with the executing contractor.
      a. When there is no dispute on the deficiency and the Sub accepts responsibility to correct it:
      b. The CA documents the deficiency and the Sub's response and intentions and they go on to another test or sequence
      c. If there is a dispute about a deficiency, regarding whether it is a deficiency or who is responsible:
      d. The deficiency shall be documented on the non-compliance form with the Sub's response and a copy given to the GC and to the Subcontractor representative assumed to be responsible.
      e. Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority is with the A/E. Final acceptance authority is with the Owner.
      f. Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency, signs the statement of correction on the non-compliance form and provides it to the CA. The CA reschedules the test and the test is repeated until satisfactory performance is achieved.
   5. Cost of Retesting.
      a. The cost for the Subcontractor to retest a verification or functional test, if they are responsible for the deficiency, shall be theirs. If they are not responsible, any cost recovery for retesting costs shall be negotiated with the GC.
   6. The Contractor shall respond in writing to the CA at least as often as commissioning meetings are being scheduled concerning the status of each apparent outstanding discrepancy identified during commissioning. Discussion shall cover explanations of any disagreements and proposals for their resolution.
   7. The CA retains the original non-conformance forms until the end of the project.

C. Failure Due to Manufacturer Defect
   1. If 10%, or three, whichever is greater, of identical pieces (size alone does not constitute a difference) of equipment fail to perform to the Contract Documents (mechanically or substantively) due to manufacturing defect, not allowing it to meet its submitted

performance spec, all identical units may be considered unacceptable. In such case, the Contractor shall provide the Owner with the following:

a. Within one week of notification, the Contractor or manufacturer's representative shall examine all other identical units making a record of the findings. The findings shall be provided within two weeks of the original notice.
b. Within two weeks of the original notification, the Contractor or manufacturer shall provide a signed and dated, written explanation of the problem, cause of failures, etc. and all proposed solutions which shall include full equipment submittals. The proposed solutions shall not significantly exceed the specification requirements of the original installation.
c. The Owner will determine whether a replacement of all identical units or a repair is acceptable.
d. Upon acceptance, the Contractor and/or manufacturer shall replace or repair all identical items, at their expense and extend the warranty accordingly, if the original
e. equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.

D. Approval
1. The CA notes each satisfactorily demonstrated function on the test form. The CA recommends acceptance of each test using a standard form. The Owner gives final approval on each test using the same form, providing a signed copy to the CA and the Contractor.

4.04 SYSTEMS/OPERATION AND MAINTENANCE (O&M) MANUALS

A. The following Systems/O&M manual requirements do not replace O&M manual documentation requirements elsewhere in these specifications.

B. Each Division shall compile and prepare documentation for all equipment and systems covered in that Division and deliver this documentation to the GC for inclusion in the Systems/O&M manuals, according to this section, prior to the training of owner personnel. This documentation shall include a combination of specification section, approved submittals and manufacturer O&M data revised to cover the specific equipment in the project.

C. The CA shall receive a copy of the Systems/O&M manuals for review.

D. Field checkout sheets and logs should be provided to the CA for inclusion in the Commissioning Record Book.

E. Review and Approvals
1. Review of the commissioning related sections of the Systems/O&M manuals shall be made by the A/E and by the CA.

4.05 WRITTEN WORK PRODUCTS

A. Written work products of Contractors will consist of the start-up and initial checkout plan described and the filled out start-up, initial checkout and verification checklists, manufacturer's factory and field testing and inspection forms, contractor's inspection and functional testing forms, Systems/O&M Manuals, /training plans and training records. These work products will be supplied to the CA to be included in the final commissioning report.

END OF SECTION

SECTION 26 0923
LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Occupancy sensors.
B. Outdoor motion sensors.
C. Time switches.
D. In-wall time switches.
E. Outdoor photo controls.
F. Daylighting controls.
G. Lighting contactors.
H. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 26 0529 - Hangers and Supports for Electrical Systems
B. Section 26 0533.16 - Boxes for Electrical Systems.
C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
D. Section 26 2726 - Wiring Devices: Devices for manual control of lighting, including wall switches, wall dimmers, and fan speed controllers.

1.03 REFERENCE STANDARDS

A. 47 CFR 15 - Radio Frequency Devices; current edition.
B. ANSI C136.10 - American National Standard for Roadway and Area Lighting Equipment - Locking-Type Photocontrol Devices and Mating Receptacles - Physical and Electrical Interchangeability and Testing; 2023.
C. ANSI C136.24 - American National Standard for Roadway and Area Lighting Equipment—Nonlocking (Button)–Type Photocontrols; 2026.
D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
E. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.
F. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.
G. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2008 (Reaffirmed 2020).
H. NEMA IA 10030 - Industrial Control and Systems: Enclosures; 2024.
I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
J. UL 773 - Plug-in, Locking Type Photocontrols for Use with Area Lighting; Current Edition, Including All Revisions.
K. UL 773A - Nonindustrial Photoelectric Switches for Lighting Control; Current Edition, Including All Revisions.
L. UL 916 - Energy Management Equipment; Current Edition, Including All Revisions.
M. UL 917 - Clock-Operated Switches; Current Edition, Including All Revisions.
N. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

O. UL 60947-1 - Low-Voltage Switchgear and Controlgear - Part 1: General Rules; Current Edition, Including All Revisions.

P. 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.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the placement of lighting control devices with millwork, furniture, equipment, etc. installed under other sections or by others.
   2. Coordinate the placement of wall switch occupancy sensors with actual installed door swings.
   3. Coordinate the placement of occupancy sensors with millwork, furniture, equipment or other potential obstructions to motion detection coverage installed under other sections or by others.
   4. Coordinate the placement of photo sensors for daylighting controls with windows, skylights, and luminaires to achieve optimum operation. Coordinate placement with ductwork, piping, equipment, or other potential obstructions to light level measurement installed under other sections or by others.
   5. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

B. Sequencing:
   1. Do not install lighting control devices until final surface finishes and painting are complete.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
   1. Occupancy Sensors: Include detailed motion detection coverage range diagrams.

C. Shop Drawings:
   1. Occupancy Sensors: Provide lighting plan indicating location, model number, and orientation of each occupancy sensor and associated system component.
   2. Daylighting Controls: Provide lighting plan indicating location, model number, and orientation of each photo sensor and associated system component.

D. Samples:
   1. Occupancy Sensors: One for each type and color specified.
   2. In-Wall Time Switches: One for each type and color specified.
   3. Daylighting Control Photo Sensors: One for each type and color specified.

E. Field Quality Control Reports.

F. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

G. Operation and Maintenance Data: Include detailed information on device programming and setup.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Locking Receptacle-Mounted Outdoor Photo Controls: Five percent of total quantity installed for each type, but not less than two of each type.
   3. Electronic Trip Circuit Breakers: Provide one portable test set.

4. Indicating Lights: Two of each different type.

I. Project Record Documents: Record actual installed locations and settings for lighting control devices.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for all occupancy sensors.

C. Provide five year manufacturer warranty for utility grade locking receptacle-mounted outdoor photo controls.

D. Provide two year manufacturer warranty for all daylighting controls.

PART 2 PRODUCTS

2.01 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.

C. Refer to division 27 for low voltage cabling color coding and related requirements.

2.02 OCCUPANCY SENSORS

A. Manufacturers:
   1. Furnish products as indicated in lighting control details included on the drawings.
   2. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

B. All Occupancy Sensors:
   1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
   2. Sensor Technology:
      a. Ultrasonic Occupancy Sensors: Designed to detect occupancy by sensing frequency shifts in emitted and reflected inaudible sound waves.
      b. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and ultrasonic technologies.

3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval.
5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.
6. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.
7. Sensitivity: Field adjustable.
8. Adaptive Technology: Field selectable; capable of self-adjusting sensitivity and time delay according to conditions.
9. Integral Photocell: For field selectable and adjustable inhibition of automatic turn-on of load when ambient lighting is above the selected level.
10. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.
11. Load Rating for Line Voltage Occupancy Sensors: As required to control the load indicated on drawings.
12. Where wired sensors are indicated, wireless sensors are acceptable provided that all components and wiring modifications necessary for proper operation are included.
13. Wireless Sensors:
    a. RF Range: 30 feet through typical construction materials.
    b. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of 47 CFR 15, for Class B application.
    c. Power: Battery-operated with minimum ten-year battery life.

C. Wall Switch Occupancy Sensors:
1. All Wall Switch Occupancy Sensors:
    a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.
    b. Unless otherwise indicated or required to control the load indicated on drawings, provide line voltage units with self-contained relay.
    c. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).
    d. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.
    e. Finish: Color to be selected by architect.
2. Passive Infrared/Ultrasonic Dual Technology Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet.

D. Wall Dimmer Occupancy Sensors:
1. General Requirements:
    a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated dimming control capability , and no leakage current to load in off mode.
    b. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).
    c. Manual-Off Override Control Capability: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.

d. Dimmer: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, and listed as complying with UL 1472; type and rating suitable for load controlled.
e. Provide fade-to-off operation to notify occupant of impending load turn-off.
f. Finish: Color to be selected by architect.

2. Passive Infrared (PIR) Wall Dimmer Occupancy Sensors: Capable of detecting motion within an area of 900 square feet.

E. Ceiling Mounted Occupancy Sensors:
1. All Ceiling Mounted Occupancy Sensors:
a. Description: Low profile occupancy sensors designed for ceiling installation.
b. Provide field selectable setting for disabling LED motion detector visual indicator.
c. Occupancy sensor to be field selectable as either manual-on/automatic-off or automatic on/off.
d. Finish: White unless otherwise indicated.
2. Ultrasonic Ceiling Mounted Occupancy Sensors:
a. Extended Range Sensors: Capable of detecting motion within an area of 2,000 square feet at a mounting height of 9 feet.
3. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:
a. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.

F. Directional Occupancy Sensors:
1. All Directional Occupancy Sensors: Designed for wall or ceiling mounting, with integral swivel for field adjustment of motion detection coverage.
a. Unless otherwise indicated or required to control the load indicated on drawings, provide low voltage units, for use with separate compatible accessory power packs.
b. Provide field selectable setting for disabling LED motion detector visual indicator.
c. Finish: White unless otherwise indicated.
2. Passive Infrared/Ultrasonic Dual Technology Directional Occupancy Sensors: Capable of detecting motion within a distance of 40 feet at a mounting height of 10 feet.

G. Power Packs for Low Voltage Occupancy Sensors:
1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage occupancy sensors for switching of line voltage loads.
2. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on drawings.
3. Input Supply Voltage: Dual rated for 120/277 V ac.
4. Load Rating: As required to control the load indicated on drawings.

H. Power Packs for Wireless Occupancy Sensors:
1. Description: Plenum rated, self-contained relay compatible with specified wireless occupancy sensors for switching of line voltage loads.
2. Input Supply Voltage: Dual rated for 120/277 V ac.
3. Load Rating: As required to control the load indicated on drawings.
4. Rated Life of Relay: One million cycles.

2.03 OUTDOOR MOTION SENSORS

A. Manufacturers:
1. Acuity Brands, Inc: www.acuitybrands.com/#sle.
2. Hubbell Lighting, Inc: www.hubbelllighting.com/#sle.
3. Cooper

4. Watt Stopper; DLM
5. Other systems approved prior to bidding..
6. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

B. Description: Factory-assembled wet location listed device suitable for wall or ceiling/eave mounting, with integral swivel for field adjustment of coverage, capable of detecting motion for automatic control of load indicated.

C. Sensor Technology: Passive Infrared (PIR) designed to detect occupancy by sensing movement of thermal energy between zones.

D. Operation: Unless otherwise indicated, motion sensor to turn load on when motion is detected and to turn load off when no motion is detected during an adjustable turn-off delay time interval.

E. Turn-Off Delay: Field adjustable, with time delay settings available up to 15 minutes.

F. Integral Photocell: For dusk to dawn operation.

G. Manual Override: Activated by switching power off to unit and then back on.

H. Load Rating: 1,000 W incandescent and fluorescent load at 120 V ac.

I. Coverage: Capable of detecting motion within a distance of 50 feet at a mounting height of 8 feet, with a field of view of 270 degrees.

2.04 TIME SWITCHES

A. Manufacturers:
1. Intermatic, Inc: www.intermatic.com/#sle.
2. NSI Industries LLC: www.nsiindustries.com/#sle.
3. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

B. Digital Electronic Time Switches:
1. Description: Factory-assembled solid state programmable controller with LCD display, listed and labeled as complying with UL 916 or UL 917.
2. Program Capability:
   a. 24-Hour Time Switches: Single channel, with same schedule for each day of the week and skip-a-day feature to omit selected days.
   b. 7-Day Time Switches: Single channel, capable of different schedule for each day of the week with additional holiday schedule available to override normal schedule for selected days.
   c. Astronomic Time Switches: Single channel, capable of different schedule for each day of the week with additional holiday schedule available to override normal schedule for selected days and field-configurable astronomic feature to automatically adjust for seasonal changes in sunrise and sunset times.
3. Schedule Capacity: Not less than 16 programmable on/off operations.
4. Provide automatic daylight savings time and leap year compensation.
5. Provide power outage backup to retain programming and maintain clock.
6. Manual override: Capable of overriding current schedule both permanently and temporarily until next scheduled event.
7. Provide remote photocell input with light level adjustment.
8. Input Supply Voltage: As indicated on the drawings.
9. Output Switch Configuration: As required to control the load indicated on drawings.
10. Output Switch Contact Ratings: As required to control the load indicated on drawings.
11. Provide lockable enclosure; environmental type per NEMA EN 10250 as specified for the following installation locations:

a. Indoor clean, dry locations: Type 1.

2.05 OUTDOOR PHOTO CONTROLS

A. Manufacturers:
1. Intermatic, Inc: www.intermatic.com/#sle.
2. NSI Industries LLC: www.nsiindustries.com/#sle.
3. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

B. Stem-Mounted Outdoor Photo Controls:
1. Description: Direct-wired photo control unit with threaded conduit mounting stem and field-adjustable swivel base, listed and labeled as complying with UL 773A.
2. Housing: Weatherproof, impact resistant polycarbonate.
3. Photo Sensor: Cadmium sulfide.
4. Provide external sliding shield for field adjustment of light level activation.
5. Light Level Activation: 1 to 5 footcandles turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.
6. Voltage: As required to control the load indicated on the drawings.
7. Failure Mode: Fails to the on position.
8. Load Rating: As required to control the load indicated on the drawings.

C. Locking Receptacle-Mounted Outdoor Photo Controls
1. Description: Plug-in locking type photo control unit complying with ANSI C136.10 for mounting on a compatible receptacle, listed and labeled as complying with UL 773.
2. Housing: Weatherproof, impact resistant UV stabilized polypropylene, color to be selected.
3. Photo Sensor: Cadmium sulfide.
4. Light Level Activation: 1 to 3 footcandles turn-on and 1.5 to 1 turn-off to turn-on ratio with instant turn-on and delayed turn-off.
5. Voltage: As required to control the load indicated on the drawings.
6. Failure Mode: Fails to the on position.
7. Load Rating: As required to control the load indicated on the drawings.
8. Surge Protection: 160 joule metal oxide varistor.

D. Button Type Outdoor Photo Controls
1. Description: Direct-wired photo control unit complying with ANSI C136.24 with weatherproof gasketed wall plate where required or indicated, listed and labeled as complying with UL 773A.
2. Housing: Weather resistant polycarbonate.
3. Photo Sensor: Cadmium sulfide.
4. Light Level Activation: 1 to 3 footcandles turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.
5. Voltage: As required to control the load indicated on the drawings.
6. Failure Mode: Fails to the on position.
7. Load Rating: As required to control the load indicated on the drawings.

2.06 DAYLIGHTING CONTROLS

A. System Description: Control system consisting of photo sensors and compatible control modules and power packs, contactors, or relays as required for automatic control of load indicated according to available natural light; capable of integrating with occupancy sensors and manual override controls.

B. Daylighting Control Photo Sensors: Low voltage class 2 photo sensor units with output signal proportional to the measured light level and provision for zero or offset based signal.

1. Sensor Type: Filtered silicon photo diode.
2. Sensor Range:
   a. Indoor Photo Sensors: 5 to 100 footcandles.
3. Finish: White unless otherwise indicated.
4. Where wired sensors are indicated, wireless sensors are acceptable provided that all components and wiring modifications necessary for proper operation are included.
5. Wireless Daylighting Control Photo Sensors:
   a. RF Range: 30 feet through typical construction materials.
   b. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of 47 CFR 15, for Class B application.
   c. Power: Battery-operated with minimum ten-year battery life.

C. Daylighting Control Switching Modules for Low Voltage Sensors: Low voltage class 2 control unit compatible with specified photo sensors, for switching of compatible power packs, contactors, or relays in response to changes in measured light levels according to selected settings.
   1. Operation: Unless otherwise indicated, load to be turned on when light level is below selected low set point and load to be turned off when light level is above selected high set point, with a no switching dead band between set points to prevent unwanted cycling.
   2. Input Delay: To prevent unwanted cycling due to intermittent light level fluctuations.
   3. Control Capability:
      a. Single Zone Switching Modules: Capable of controlling one programmable channel.

D. Daylighting Control Switching Modules for Wireless Sensors:
   1. Description: Plenum rated, self-contained relay compatible with specified wireless photo sensors for switching of line voltage loads in response to changes in measured light levels according to selected settings.
   2. Operation: Unless otherwise indicated, load to be turned on when light level is below selected low set point and load to be turned off when light level is above selected high set point, with a no switching dead band between set points to prevent unwanted cycling.
   3. Input Delay: To prevent unwanted cycling due to intermittent light level fluctuations.
   4. Control Capability: Capable of controlling one programmable channel.
   5. Input Supply Voltage: Dual rated for 120/277 V ac.
   6. Load Rating: As required to control the load indicated on drawings.
   7. Rated Life of Relay: One million cycles.

E. Daylighting Control Dimming Modules for Low Voltage Sensors: Low voltage class 2 control unit compatible with specified photo sensors and with specified dimming ballasts, for both continuous dimming of compatible dimming ballasts and switching of compatible power packs, contactors, or relays in response to changes in measured light levels according to selected settings.
   1. Operation: Unless otherwise indicated, specified load to be continuously brightened as not enough daylight becomes available and continuously dimmed as enough daylight becomes available.
   2. Control Capability: Capable of controlling up to three separately programmable channels, with up to 50 ballasts per channel.
   3. Dimming and Fade Rates: Adjustable from 5 to 60 seconds.
   4. Cut-Off Delay: Selectable and adjustable from 0 to 20 minutes.

F. Daylighting Control Dimming Modules for Wireless Sensors:
   1. Description: Plenum rated control unit compatible with specified wireless photo sensors and with specified dimming ballasts, for continuous dimming of compatible dimming ballasts in response to changes in measured light levels according to selected settings.

2. Operation: Unless otherwise indicated, specified load to be continuously brightened as not enough daylight becomes available and continuously dimmed as enough daylight becomes available.
3. Load to be turned off when available daylight is sufficient to fully dim the load, after the selected time delay.
4. Control Capability: Capable of controlling up to 32 ballasts with up to two separately programmable daylighting zones.

G. Power Packs for Low Voltage Daylighting Control Modules:
1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage daylighting control modules for switching of line voltage loads. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on drawings.
2. Input Supply Voltage: Dual rated for 120/277 V ac.
3. Load Ratings: As required to control the load indicated on drawings.

2.07 LIGHTING CONTACTORS

A. Manufacturers:
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. Description: Magnetic lighting contactors complying with NEMA ICS 2, and listed and labeled as complying with UL 60947-1 and UL 60947-4-1; noncombination type unless otherwise indicated; ratings, configurations and features as indicated on the drawings.

C. Short Circuit Current Rating:
1. Provide contactors with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

D. Enclosures:
1. Comply with NEMA IA 10030.
2. 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 12.
b. Outdoor Locations: Type 3R or Type 4.
3. Finish: Manufacturer's standard unless otherwise indicated.

PART 3 EXECUTION

3.01 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 openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.

F. Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.

G. Verify that conditions are satisfactory for installation prior to starting work.

3.02 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.

3.03 INSTALLATION

A. Install lighting control devices 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 0533.16 as required for installation of lighting control devices provided under this section.
   1. Mounting Heights: Unless otherwise indicated, as follows:
      a. Wall Switch Occupancy Sensors: 42 inches above finished floor.
      b. In-Wall Time Switches: 42 inches above finished floor.
      c. In-Wall Interval Timers: 42 inches above finished floor.
   2. Orient outlet boxes for vertical installation of lighting control devices unless otherwise indicated.
   3. Locate wall switch occupancy sensors 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.

C. Install lighting control devices in accordance with manufacturer's instructions.

D. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

E. Install lighting control devices plumb and level, and held securely in place.

F. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 26 2726.

G. Provide required supports in accordance with Section 26 0529.

H. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface 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.

I. Identify lighting control devices in accordance with Section 26 0553.

J. Occupancy Sensor Locations:
   1. Location Adjustments: Locations indicated are diagrammatic and only intended to indicate which rooms or areas require devices. Provide quantity and locations as required for complete coverage of respective room or area based on manufacturer's recommendations for installed devices.
   2. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors a minimum of 4 feet from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.

K. Outdoor Photo Control Locations:
   1. Where possible, locate outdoor photo controls with photo sensor facing north. If north facing photo sensor is not possible, install with photo sensor facing east, west, or down.
   2. Locate outdoor photo controls so that photo sensors do not face artificial light sources, including light sources controlled by the photo control itself.

L. Install outdoor photo controls so that connections are weatherproof. Do not install photo controls with conduit stem facing up in order to prevent infiltration of water into the photo control.

M. Daylighting Control Photo Sensor Locations:
   1. Location Adjustments: Locations indicated are diagrammatic and only intended to indicate which rooms or areas require devices. Provide quantity and locations as required for proper control of respective room or area based on manufacturer's recommendations for installed devices.
   2. Unless otherwise indicated, locate photo sensors for closed loop systems to accurately measure the light level controlled at the designated task location, while minimizing the measured amount of direct light from natural or artificial sources such as windows or pendant luminaires.
   3. Unless otherwise indicated, locate photo sensors for open loop systems to accurately measure the level of daylight coming into the space, while minimizing the measured amount of lighting from artificial sources.

N. Lamp Burn-In: Operate lamps at full output for minimum of 100 hours or prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.

O. Unless otherwise indicated, install power packs for lighting control devices above accessible ceiling or above access panel in inaccessible ceiling near the sensor location.

P. Where indicated or required, provide cabinet or enclosure in accordance with Section 26 0533.16 for mounting of lighting control device system components.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect each lighting control device for damage and defects.

C. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test results in written report to be included with submittals.

D. Test time switches to verify proper operation.

E. Test outdoor photo controls to verify proper operation, including time delays where applicable.

F. Test daylighting controls to verify proper operation, including light level measurements and time delays where applicable. Record test results in written report to be included with submittals.

G. Correct wiring deficiencies and replace damaged or defective lighting control devices.

3.05 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Architect.

C. Adjust position of directional occupancy sensors and outdoor motion sensors to achieve optimal coverage as required.

D. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.

E. Adjust time switch settings to achieve desired operation schedule as indicated or as directed by Architect. Record settings in written report to be included with submittals.

F. Adjust external sliding shields on outdoor photo controls under optimum lighting conditions to achieve desired turn-on and turn-off activation as indicated or as directed by Architect.

G. Adjust daylighting controls under optimum lighting conditions after all room finishes, furniture, and window treatments have been installed to achieve desired operation as indicated or as directed by Architect. Record settings in written report to be included with submittals. Readjust

controls calibrated prior to installation of final room finishes, furniture, and window treatments that do not function properly as determined by Architect.

3.06 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.07 COMMISSIONING

A. See Section 01 4553 - Code-Required Quality Control for commissioning requirements.

B. Provide a written test report indicating that all lighting control systems have been commissioned and tested, and found to be functioning in accordance with contract document and code requirements. Ensure that control hardware and software are calibrated, adjusted, programmed and in proper working condition in accordance with the contract documents, manufacturer's instructions and code requirements. Functional testing shall be in accordance with IECC sections C408.3.1.1 and C408.3.1.2 for the applicable control types.

3.08 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of lighting control devices to Architect, and correct deficiencies or make adjustments as directed.

B. Training: Train Owner's personnel on operation, adjustment, programming, and maintenance of lighting control 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: Qualified contractor familiar with the project and with sufficient knowledge of the installed lighting control devices.
   4. Location: At project site.

END OF SECTION

SECTION 26 2200
LOW-VOLTAGE TRANSFORMERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General purpose transformers.

B. K-factor transformers rated for nonlinear loads.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 26 0526 - Grounding and Bonding for Electrical Systems.

C. Section 26 0529 - Hangers and Supports for Electrical Systems.

D. Section 26 0533.13 - Conduit for Electrical Systems: Flexible conduit connections.

E. Section 26 0548 - Vibration and Seismic Controls for Electrical Systems.

F. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

G. Section 26 2416 - Panelboards.

H. Section 26 2713 - Electricity Metering: Instrument transformers for electrical metering.

1.03 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; 2023.

E. NECA 409 - Standard for Installing and Maintaining Dry-Type Transformers; 2015.

F. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

G. NEMA ST 20 - Dry Type Transformers for General Applications; 2021.

H. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

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.

1.04 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.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. 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. Vibration Isolators: Include attachment method and rated load and deflection.
   2. K-factor Rated Transformers: Include K-factor ratings.

C. Shop Drawings: Provide dimensioned plan and elevation views of transformers and adjacent equipment with all required clearances indicated.

D. Source Quality Control Test Reports: Include reports for tests designated in NEMA ST 20 as design and routine tests.

E. Field Quality Control Test Reports.

F. 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.

G. Maintenance Data: Include recommended maintenance procedures and intervals.

H. Project Record Documents: Record actual locations of transformers.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 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.

1.08 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.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 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 transformers produced by same manufacturer as other electrical distribution equipment used for project and obtained from single supplier.

2.02 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.

2.03 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 150 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.

2.04 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.

C. Insulation System and Allowable Average Winding Temperature Rise: Class 220 degrees C insulation system with 150 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.

PART 3 EXECUTION

3.01 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.

3.02 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 0533.13, 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 0529, 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 3 inch high concrete pad constructed in accordance with Section 03 3000.
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 0526.

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 0553.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - 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.

3.04 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.

3.05 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 2413
SWITCHBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Low-voltage (600 V and less) switchboards and associated accessories for service and distribution applications.

B. Overcurrent protective devices for switchboards.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 26 0526 - Grounding and Bonding for Electrical Systems.

C. Section 26 0529 - Hangers and Supports for Electrical Systems.

D. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 26 0573 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.

F. Section 26 2100 - Low-Voltage Electrical Service Entrance.
   1. Includes Utility Company contact information.

G. Section 26 4300 - Surge Protective Devices.

1.03 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; 2023.

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 1000 Volts or Less; 2023.

H. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

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.

1.04 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. Coordinate with Owner to arrange for Utility Company required access to equipment for installation and maintenance.
3. See Section 26 2100 for Utility Company contact information and additional requirements.
4. Obtain Utility Company approval of switchboard prior to fabrication.
5. Preinstallation Meeting: Convene one week prior to commencing work of this section to review requirements with Utility Company representative.
6. Arrange for inspections necessary to obtain Utility Company approval of installation.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for switchboards, enclosures, overcurrent protective devices, and other installed components and accessories.
1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.

C. 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.
2. Include wiring diagrams showing all factory and field connections.
3. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
4. Include documentation demonstrating selective coordination upon request.

D. Service Entrance Switchboards: Include documentation of Utility Company approval of switchboard.

E. Source Quality Control Test Reports: Include reports for tests designated in NEMA PB 2 as production (routine) tests.

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.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 6000 - Product Requirements, for additional provisions.

2. Enclosure Keys: Two of each different key.
3. Electronic Trip Circuit Breakers: Provide one portable test set.
4. Drawout Devices:
   a. Handles Necessary for Racking of Devices: One for each electrical room containing switchgear with drawout devices.
   b. Lifting Yokes: One of each different yoke required, for each electrical room containing drawout devices.
   c. Portable Lifting Devices: One for each electrical room containing switchboards with drawout devices and no integral top rail-mounted lifting device.
   d. Removable Covers: One for blocking each different opening size when device is temporarily removed from its compartment.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.07 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.

1.08 FIELD CONDITIONS

A. Maintain field conditions within required service conditions during and after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Switchboards:
   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.
   5. Source Limitations: Provide switchboards and associated components produced by same manufacturer as other electrical distribution equipment used for project and obtained from single supplier.

2.02 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 Device(s): Panel/group-mounted or 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.
   4. See Section 26 2100 for additional requirements.

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.
   2. Provide switchboards and associated components suitable for operation at indicated ratings under the service conditions at the installed location.

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 0573.

H. 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.

I. 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.

J. Conductor Terminations: Suitable for use with the conductors to be installed.
   1. Line Conductor Terminations:
      a. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
      b. Main and Neutral Lug Type: Mechanical.
   2. Load Conductor Terminations:
      a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
      b. Lug Type:
         1) Provide mechanical lugs unless otherwise indicated.

K. 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).
      b. Outdoor Locations: Type 3R.
   2. Finish: Manufacturer's standard unless otherwise indicated.
   3. Outdoor Enclosures:
      a. Color: Manufacturer's standard.
      b. Access Doors: Lockable, with all locks keyed alike.

L. 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.

M. Surge Protective Devices: Where factory-installed, internally mounted surge protective devices are provided in accordance with Section 26 4300, list switchboards as a complete assembly including surge protective device.

N. 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.
   2. Where accessory ground fault sensing and relaying equipment is used, equip companion overcurrent protective devices with ground-fault shunt trips.
      a. Use zero sequence or residual ground fault detection method unless otherwise indicated.
      b. Provide test panel and field-adjustable ground fault pick-up and delay settings.

O. 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.

P. Owner Metering:
   1. Provide microprocessor-based digital electrical metering system including all instrument transformers, wiring, and connections necessary for measurements specified.
   2. Measured Parameters:
      a. Voltage (Volts AC): Line-to-line, line-to-neutral for each phase.
      b. Current (Amps): For each phase and neutral.
      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. For each phase, and 3-phase average.
      h. Real energy (kWh).
      i. Reactive energy (kVARh).
      j. Apparent energy (kVAh).
      k. Current demand.
      l. Power demand: Real, reactive, and apparent.
   3. Meter Accuracy: Plus/minus 1.0 percent.
   4. Features:
      a. Communications Capability: Compatible with system indicated. Provide all accessories necessary for proper interface.

b. Adjustable demand interval.
c. Remote monitoring capability via PC.

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.

2.03 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 thermal magnetic circuit breakers unless otherwise indicated.
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.
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.
3) Provide communication capability where indicated: Compatible with system indicated.
e. Provide the following circuit breaker types where indicated:
1) 100 Percent Rated Circuit Breakers: Listed for application within the switchboard where installed at 100 percent of the continuous current rating.
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) 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.

2.04 SOURCE QUALITY CONTROL

A. See Section 01 4000 - 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

3.01 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.

3.02 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 0529.

F. Install switchboards plumb and level.

G. Unless otherwise indicated, mount switchboards on properly sized 4 inch high concrete pad constructed in accordance with Section 03 3000.

H. Provide grounding and bonding in accordance with Section 26 0526.

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 0573.

L. Set field-adjustable ground fault protection pickup and time delay settings as indicated.

M. Provide filler plates to cover unused spaces in switchboards.

N. Identify switchboards in accordance with Section 26 0553.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Provide services of a manufacturer's authorized representative to observe installation and assist in 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. 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.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of switchboard covers and doors.

3.05 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.

3.06 CLOSEOUT ACTIVITIES

A. See Section 01 7900 - Demonstration and Training, for additional requirements.

B. 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.

3.07 PROTECTION

A. Protect installed switchboards from subsequent construction operations.

END OF SECTION

SECTION 26 2416
PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Power distribution panelboards.

B. Lighting and appliance panelboards.

C. Overcurrent protective devices for panelboards.

1.02 RELATED REQUIREMENTS

A. Section 26 0526 - Grounding and Bonding for Electrical Systems.

B. Section 26 0529 - Hangers and Supports for Electrical Systems.

C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

D. Section 26 0573 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.

E. Section 26 4300 - Surge Protective Devices.

1.03 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; 2023.

C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2025.

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; 2025.

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 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

N. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

O. UL 1699 - Arc-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

PART 2 PRODUCTS

2.01 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 panelboards and associated components produced by same manufacturer as other electrical distribution equipment used for project and obtained from a single supplier.

2.02 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 0573.
   2. Label equipment utilizing series ratings as required by NFPA 70.

D. Panelboards Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

E. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

F. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

G. Bussing: Sized in accordance with UL 67 temperature rise requirements.
   1. Provide fully rated neutral bus unless otherwise 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 indicated, where oversized neutral conductors are provided, or 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.
   4. Provide separate isolated/insulated ground bus where indicated or where isolated grounding conductors are provided.

H. Conductor Terminations: Suitable for use with the conductors to be installed.

I. 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.
   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.

J. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

K. Surge Protective Devices: Where factory-installed, internally mounted surge protective devices are provided in accordance with Section 26 4300, list and label panelboards as a complete assembly including surge protective device.

L. Load centers are not acceptable.

2.03 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: Aluminum, suitable for terminating aluminum or copper conductors.
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 or plug-in type secured with locking mechanical restraints.
2. Provide thermal magnetic circuit breakers unless otherwise indicated.

E. Enclosures:
1. Provide surface-mounted enclosures unless otherwise 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.

2.04 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: Aluminum, suitable for terminating aluminum or copper conductors.
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 unless otherwise indicated.

E. Enclosures:
1. Provide surface-mounted or flush-mounted enclosures as indicated.
2. Provide clear plastic circuit directory holder mounted on inside of door.

2.05 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.
   3. Conductor Terminations:
      a. Provide mechanical lugs unless otherwise indicated.
      b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   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.
      c. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Combination type listed as complying with UL 1699.
      d. 100 Percent Rated Circuit Breakers: Listed for application within the panelboard where installed at 100 percent of the continuous current rating.
   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.

2.06 SOURCE QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

3.01 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.

3.02 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 0529.

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. 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.

J. Provide grounding and bonding in accordance with Section 26 0526.
   1. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on isolated/insulated ground bus.
   2. Terminate branch circuit isolated grounding conductors on isolated/insulated ground bus only. Do not terminate on solidly bonded equipment ground bus.

K. Install all field-installed branch devices, components, and accessories.

L. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

M. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.

N. Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed according to Section 26 0573.

O. Provide filler plates to cover unused spaces in panelboards.

P. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads where indicated. Also provide for the following:
   1. Emergency and night lighting circuits.
   2. Fire detection and alarm circuits.
   3. Communications equipment circuits.
   4. Intrusion detection and access control system circuits.
   5. Video surveillance system circuits.

Q. Identify panelboards in accordance with Section 26 0553.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - 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 AFCI circuit breakers to verify proper operation.

G. Test shunt trips to verify proper operation.

H. 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.

I. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.04 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.

3.05 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 2713
ELECTRICITY METERING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Equipment for Owner electricity metering:
   1. Single circuit electricity meters.
   2. Multi-circuit electricity meters.

1.02 RELATED REQUIREMENTS

A. Section 26 0526 - Grounding and Bonding for Electrical Systems.

B. Section 26 0529 - Hangers and Supports for Electrical Systems.

C. Section 26 0533.16 - Boxes for Electrical Systems: Cabinets and enclosures for metering system components.

D. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 26 2813 - Fuses.

1.03 REFERENCE STANDARDS

A. ANSI C12.1 - Electric Meters - Code for Electricity Metering; 2026.

B. IEC 62053-21 - Electricity Metering Equipment - Particular Requirements - Part 21: Static Meters for AC Active Energy (Classes 0,5, 1 and 2); 2020.

C. IEC 62053-23 - Electricity Metering Equipment - Particular Requirements - Part 23: Static Meters for Reactive Energy (Classes 2 and 3); 2020.

D. IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers; 2016.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

F. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

G. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate work to provide equipment suitable for interface with electricity metering systems to be provided.
   2. Coordinate the work with other installers to provide communication lines required for electricity metering system interface.
   3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Preinstallation Meeting: Conduct meeting with facility representative and other related equipment manufacturers to discuss electricity metering system interface requirements.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for electricity metering systems and associated components and accessories. Include ratings, configurations, standard wiring diagrams, dimensions, service condition requirements, and installed features.

C. Shop Drawings: Include system interconnection schematic diagrams showing all factory and field connections. Include requirements for interface with other systems.

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. Field Quality Control Test Reports.

F. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Enclosure Keys: Two of each different key.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

B. Store products in manufacturer's unopened packaging, keep dry and protect from damage until ready for installation.

1.08 FIELD CONDITIONS

A. Maintain field conditions within required service conditions during and after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Electricity Meters:
   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.
   5. Source Limitations: Provide electricity meters produced by single manufacturer and obtained from single supplier.

2.02 EQUIPMENT FOR OWNER ELECTRICITY METERING

A. Provide microprocessor-based digital electricity metering systems including all instrument transformers, wiring, and connections necessary for measurements specified.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Provide electricity metering systems and associated components compatible with the equipment and associated circuits to be metered.

D. Service Conditions: Provide electricity meters suitable for operation under the service conditions at the installed location.

E. Enclosures:
   1. Where not furnished by manufacturer, provide required cabinets and enclosures in accordance with Section 26 0533.16.

2. 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 or Type 4.
3. Provide lockable door(s) for outdoor locations.
4. Finish: Manufacturer's standard unless otherwise indicated.

F. Instrument Transformers:
1. Comply with IEEE C57.13, where applicable.
2. Select suitable ratio, burden, and accuracy as required for connected devices.
3. Current Transformers: Compatible with connected meters; replace meters damaged by connection of incompatible current transformers. Provide shorting terminal blocks for connection of secondaries where applicable.
4. Potential Transformers: Include primary and secondary fuses with disconnecting means.

2.03 SINGLE CIRCUIT ELECTRICITY METERS

A. Single Circuit Electricity Meter:
1. Accuracy:
   a. Real/Active Power/Energy: Revenue grade; plus/minus 1.0 percent; complying with ANSI C12.1 and/or IEC 62053-21 Class 1.
   b. Reactive Power/Energy: Plus/minus 2.0 percent, complying with IEC 62053-23 Class 2.
2. Measured Parameters:
   a. Voltage (Volts AC); line-to-line and line-to-neutral; per phase.
   b. Current (Amps); per phase.
   c. Frequency (Hz).
   d. Real/active power (kW); per phase and total of all phases.
   e. Reactive power (kVAR); per phase and total of all phases.
   f. Apparent power (kVA); per phase and total of all phases.
   g. Power factor; per phase and total of all phases.
   h. Real/active energy (kWh).
   i. Reactive energy (kVARh).
   j. Apparent energy (kVAh).
   k. Power demand; real/active, reactive, and apparent; present and maximum.
   l. Current demand.
   m. Bi-directional energy measurements; real/active and reactive; imported and exported.
3. Data logging.
4. Alarm capability, with configurable setpoints.
   a. Current over range.
   b. Voltage over range.
5. Inputs:
   a. Pulse Contact Accumulator Input(s): Two; user-configurable to support measurement of other related energy values (gas, water, steam, etc.) using pulse-output transducers.
6. Outputs:
   a. Pulse Output(s): One.
7. Communications: Compatible with connected systems. Provide all accessories necessary for proper interface.
   a. Serial Communications: RS-485; support for Modbus RTU protocol.
   b. Ethernet Communications: Support for Modbus TCP protocol.

B. Other Acceptable Product(s) - Single Circuit Electricity Meters:

1. Veris Industries; E5x Series Enhanced Power and Energy Meter.
2. Veris Industries; E2x Series Enercept FLEX Compact Power and Energy Meter.

2.04 MULTI-CIRCUIT ELECTRICITY METERS

A. Multi-Circuit Electricity Meter:
   1. Metering Capacity: As indicated or as required for circuits to be metered.
   2. Accuracy:
      a. Real/Active Power/Energy: Revenue grade; plus/minus 1.0 percent; complying with ANSI C12.1 and/or IEC 62053-21 Class 1.
      b. Reactive Power/Energy: Plus/minus 2.0 percent, complying with IEC 62053-23 Class 2.
   3. Measured Parameters:
      a. Voltage (Volts AC); line-to-line and line-to-neutral; per phase.
      b. Current (Amps); per phase.
      c. Frequency (Hz).
      d. Real/active power (kW); per phase and total of all phases.
      e. Reactive power (kVAR); per phase and total of all phases.
      f. Apparent power (kVA); per phase and total of all phases.
      g. Power factor; per phase and total of all phases.
      h. Real/active energy (kWh).
      i. Reactive energy (kVARh).
      j. Apparent energy (kVAh).
      k. Power demand; real/active; present and maximum.
      l. Current demand.
   4. Data logging.
      a. Storage Capacity: A data acquisition system shall have the capability to store the data from the required meters and other sensing devices for a minimum of 36 months. The data acquisition system shall have the capability to store real-time energy consumption data and provide hourly, daily, monthly and yearly logged data for each end-use cate-gory required by Section C405.12.2.
   5. Alarm capability, with configurable setpoints.
      a. Current over range.
      b. Voltage over range.
   6. Inputs:
   7. Outputs:
      a. Pulse Output(s): One.
   8. Communications: Compatible with connected systems. Provide all accessories necessary for proper interface.
      a. Serial Communications: RS-485; support for Modbus RTU protocol.
      b. Ethernet Communications: Support for Modbus TCP protocol.

B. Other Acceptable Product(s) - Multi-Circuit Electricity Meters:
   1. Veris Industries E3x Series Panelboard Monitoring System.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of metering systems and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive meters.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Provide required support and attachment components in accordance with Section 26 0529.

D. Provide grounding and bonding in accordance with Section 26 0526.

E. Provide fuses complying with Section 26 2813 as required.

F. Identify meters and associated wiring in accordance with Section 26 0553.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Meters: Perform inspections and tests listed in NETA ATS, Section 7.11.2.

D. 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.

E. Correct deficiencies and replace damaged or defective metering system components.

F. Submit detailed reports indicating inspection and testing results and corrective actions taken.

3.04 ADJUSTING

A. Program system parameters according to requirements of Owner.

3.05 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.06 CLOSEOUT ACTIVITIES

A. See Section 01 7900 - Demonstration and Training, for additional requirements.

B. Training: Train Owner's personnel on operation, adjustment, and maintenance of system.
   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.

3.07 PROTECTION

A. Protect installed system components from subsequent construction operations.

END OF SECTION

SECTION 26 2726
WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall switches.
B. Wall dimmers.
C. Receptacles.
D. Wall plates and covers.
E. Floor box service fittings.
F. Poke-through assemblies.
G. Access floor boxes.

1.02 RELATED REQUIREMENTS

A. Section 26 0533.16 - Boxes for Electrical Systems.
B. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
C. Section 27 1000 - Structured Cabling: Voice and data jacks.

1.03 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; 2023.
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.

1.04 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.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

C. Samples: One for each type and color of device and wall plate specified.

D. Field Quality Control Test Reports.

E. Operation and Maintenance Data:
1. Wall Dimmers: Include information on operation and setting of presets.
2. GFCI Receptacles: Include information on status indicators.
3. Surge Protection Receptacles: Include information on status indicators.

F. Project Record Documents: Record actual installed locations of wiring devices.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 6000 - Product Requirements, for additional provisions.
2. Screwdrivers for Tamper-Resistant Screws: Two for each type of screw.
3. Extra Keys for Locking Switches: Two of each type.
4. Extra Surge Protection Receptacles: Two of each type.
5. Extra Wall Plates: One of each style, size, and finish.
6. Extra Flush Floor Service Fittings: Two of each type.
7. Extra Poke-Through Core Hole Closure Plugs: Two for each core size.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Products: Listed, classified, and labeled as suitable for the purpose intended.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

PART 2 PRODUCTS

2.01 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 GFCI protection for receptacles installed within 6 feet of sinks.

E. Provide GFCI protection for receptacles installed in kitchens.

F. Provide GFCI protection for receptacles serving electric drinking fountains.

G. Provide isolated ground receptacles for receptacles serving computers and electronic cash registers.

H. Unless noted otherwise, do not use combination switch/receptacle devices.

I. For flush floor service fittings, use tile rings for installations in tile floors.

J. For flush floor service fittings, use carpet flanges for installations in carpeted floors.

2.02 WIRING DEVICE FINISHES

A. Provide wiring device finishes as described below unless otherwise indicated.

B. Wiring Devices, Unless Otherwise Indicated: Color to be selected by architect with stainless steel wall plate.

C. Wiring Devices Connected to Emergency Power: Red with stainless steel wall plate factory engraved "Emergency".

D. Flush Floor Box Service Fittings: Color to be selected by architect wiring devices with aluminum cover and ring/flange.

E. Flush Poke-Through Service Fittings: Color to be selected by architect wiring devices with aluminum cover and aluminum flange.

F. Access Floor Boxes: Gray wiring devices with gray steel cover with insert to match floor covering.

2.03 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.

2.04 RECEPTACLES

A. Manufacturers:
   1. Hubbell Incorporated: www.hubbell.com/#sle.
   2. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.
   3. Lutron Electronics Company, Inc; Designer Style: www.lutron.com/#sle.
   4. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.
   5. Source Limitations: Where wall controls are furnished as part of lighting control system, provide accessory matching receptacles and wallplates by the same manufacturer in locations indicated.

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: Commercial 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. Isolated Ground Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R, with ground contacts isolated from mounting strap; isolated ground triangle mark on device face; single or duplex as indicated on the drawings.
4. Tamper Resistant Convenience Receptacles: Commercial and 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: Commercial 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.
   a. Provide test and reset buttons of same color as device.
2. Standard GFCI Receptacles: Commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
3. Weather Resistant GFCI Receptacles: Commercial 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: Commercial 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: Commercial 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.

2.05 WALL PLATES AND COVERS

A. Manufacturers:
1. Hubbell Incorporated: www.hubbell-wiring.com/#sle.
2. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.
3. Lutron Electronics Company, Inc: www.lutron.com/#sle.
4. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.

B. 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.

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.

2.06 FLOOR BOX SERVICE FITTINGS

A. Manufacturers:
1. Hubbell Incorporated: www.hubbell.com/#sle.
2. Thomas & Betts Corporation: www.tnb.com/#sle.
3. Wiremold, a brand of Legrand North America, Inc: www.legrand.us/#sle.

B. Description: Service fittings compatible with floor boxes provided under Section 26 0533.16 with components, adapters, and trims required for complete installation.

C. Flush Floor Service Fittings:
1. Dual Service Flush Combination Outlets:
a. Cover: Rectangular.
b. Configuration:
1) Power: One standard convenience duplex receptacle(s) with duplex flap opening(s).
2) Voice and Data Jacks: As specified in Section 27 1000.
2. Accessories:
a. Tile Rings: Finish to match covers; configuration as required to accommodate specified covers.
b. Carpet Flanges: Finish to match covers; configuration as required to accommodate specified covers.

2.07 POKE-THROUGH ASSEMBLIES

A. Manufacturers:
1. Hubbell Incorporated: www.hubbell.com/#sle.
2. Thomas & Betts Corporation: www.tnb.com/#sle.
3. 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. Dual Service Flush Combination Outlets:
a. Cover: Hinged door(s).
b. Configuration:
1) Power: One standard convenience duplex receptacle(s).
2) Voice and Data Jacks: As specified in Section 27 1000.
2. Accessories:
a. Closure Plugs: Size and fire rating as required to seal unused core hole and maintain fire rating of floor.

PART 3 EXECUTION

3.01 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 openings in access floor are in proper locations.

I. Verify that conditions are satisfactory for installation prior to starting work.

3.02 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.

3.03 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 0533.16 as required for installation of wiring devices provided under this section.
   1. Mounting Heights: Unless otherwise indicated, as follows:
      a. Wall Switches: 42 inches above finished floor.
      b. Wall Dimmers: 42 inches above finished floor.
      c. Receptacles: 18 inches above finished floor or 6 inches above counter.
   2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
   3. 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.
   4. 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.
   5. 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. For isolated ground receptacles, connect wiring device grounding terminal only to identified branch circuit isolated equipment grounding conductor. Do not connect grounding terminal to outlet box or normal branch circuit equipment grounding conductor.

I. Unless otherwise indicated, GFCI receptacles may be connected to provide feed-through protection to downstream devices. Label such devices to indicate they are protected by upstream GFCI protection.

J. Install wiring devices plumb and level with mounting yoke held rigidly in place.

K. Install wall switches with OFF position down.

L. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.

M. 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.

N. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

O. Identify wiring devices in accordance with Section 26 0553.

P. Install poke-through closure plugs in each unused core holes to maintain fire rating of floor.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - 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.

3.05 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

3.06 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 2813
FUSES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fuses.

B. Spare fuse cabinet.

1.02 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.

1.03 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.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. 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.

C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Fuses: One set(s) of three for each type and size installed.
   3. Fuse Pullers: One set(s) compatible with each type and size installed.
   4. Spare Fuse Cabinet Keys: Two.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

PART 2 PRODUCTS

2.01 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.

2.02 APPLICATIONS

A. In-Line Protection for Pole-Mounted Luminaires: Class CC, time-delay.

B. Primary Protection for Control Transformers: Class CC, time-delay.

2.03 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 CC Fuses: Comply with UL 248-4.

H. Provide the following accessories where indicated or where required to complete installation:
   1. Fuseholders: Compatible with indicated fuses.

2.04 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

3.01 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.

3.02 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 0553.

END OF SECTION

SECTION 26 2816.13
ENCLOSED CIRCUIT BREAKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Enclosed circuit breakers.

1.02 RELATED REQUIREMENTS

A. Section 26 0526 - Grounding and Bonding for Electrical Systems.

B. Section 26 0529 - Hangers and Supports for Electrical Systems.

C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

D. Section 26 0573 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.

1.03 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; 2023.

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; 2025.

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 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

J. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.

1.04 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.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for circuit breakers, enclosures, and other installed components and accessories.

C. 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.
   2. Include wiring diagrams showing all factory and field connections.

D. Field Quality Control Test Reports.

E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

F. Project Record Documents: Record actual installed locations of enclosed circuit breakers.

G. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.07 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.

1.08 FIELD CONDITIONS

A. Maintain ambient temperature between 23 degrees F and 104 degrees F during and after installation of enclosed circuit breakers.

PART 2 PRODUCTS

2.01 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 circuit breakers and associated components produced by same manufacturer as other electrical distribution equipment used for project and obtained from single supplier.

2.02 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 0573.

E. Conductor Terminations: Suitable for use with the conductors to be installed.

F. Provide thermal magnetic circuit breakers unless otherwise indicated.

G. Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.

H. Provide solidly bonded equipment ground bus in each enclosed circuit breaker, with a suitable lug for terminating each equipment grounding conductor.

I. 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.
   3. Provide surface-mounted enclosures unless otherwise indicated.

J. Provide externally operable handle with means for locking in the OFF position.

K. 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.

2.03 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: Aluminum, suitable for terminating aluminum or copper conductors.

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.
   1. Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.

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. Instantaneous pickup.
      c. 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 circuit breaker types where indicated:
   1. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
   2. Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.
   3. Current Limiting Circuit Breakers: Without using fusible elements, designed to limit the let-through energy to a value less than the energy of a one-half cycle wave of the symmetrical prospective current when operating within its current limiting range.

H. 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

3.01 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.

3.02 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 0529.

E. Install enclosed circuit breakers plumb.

F. Install flush-mounted enclosed circuit breakers so that trims fit completely flush to wall with no gaps and rough opening completely covered.

G. 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.

H. Provide grounding and bonding in accordance with Section 26 0526.

I. Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed according to Section 26 0573.

J. Set field-adjustable ground fault protection pickup and time delay settings as indicated.

K. Identify enclosed circuit breakers in accordance with Section 26 0553.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - 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 for circuit breakers used for service entrance. Tests listed as optional are not required.

D. 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.

E. Test GFCI circuit breakers to verify proper operation.

F. Test shunt trips to verify proper operation.

G. Correct deficiencies and replace damaged or defective enclosed circuit breakers.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 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 2816.16
ENCLOSED SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Enclosed safety switches.

1.02 RELATED REQUIREMENTS

A. Section 26 0526 - Grounding and Bonding for Electrical Systems.

B. Section 26 0529 - Hangers and Supports for Electrical Systems.

C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

D. Section 26 0573 - Power System Studies: Additional criteria for the selection of equipment and associated protective devices specified in this section.

E. Section 26 2813 - Fuses.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

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; 2025.

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.

I. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

1.04 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.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.

C. 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 switches and adjacent equipment with all required clearances indicated.
   2. Include wiring diagrams showing all factory and field connections.

D. Field Quality Control Test Reports.

E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

F. Project Record Documents: Record actual locations of enclosed switches.

G. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.07 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.

1.08 FIELD CONDITIONS

A. Maintain ambient temperature between -22 degrees F and 104 degrees F during and after installation of enclosed switches.

PART 2 PRODUCTS

2.01 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.

2.02 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 0573.
   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.
      c. Double Throw Switches Protected by Class R, Class J, or Class T Fuses: 100,000 rms symmetrical amperes.

G. Enclosed Safety Switches Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

H. Provide with switch blade contact position that is visible when the cover is open.

I. 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.

J. Conductor Terminations: Suitable for use with the conductors to be installed.

K. Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.

L. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.

M. 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.

N. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

O. Heavy Duty Switches:
   1. Comply with NEMA BS 31047.
   2. Conductor Terminations:
      a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.

PART 3 EXECUTION

3.01 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.

3.02 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 0529.

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 0526.

H. Provide fuses complying with Section 26 2813 for fusible switches as indicated or as required by equipment manufacturer's recommendations.

I. Identify enclosed switches in accordance with Section 26 0553.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - 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.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 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 3213
ENGINE GENERATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Packaged engine generator system and associated components and accessories:
   1. Engine and engine accessory equipment.
   2. Alternator (generator).
   3. Generator set control system.
   4. Generator set enclosure.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 26 0526 - Grounding and Bonding for Electrical Systems.

C. Section 26 0529 - Hangers and Supports for Electrical Systems.

D. Section 26 0548 - Vibration and Seismic Controls for Electrical Systems.

E. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

F. Section 26 3600 - Transfer Switches.

1.03 REFERENCE STANDARDS

A. ASTM D975 - Standard Specification for Diesel Fuel; 2026b.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

C. NECA/EGSA 404 - Standard for Installing Generator Sets; 2014.

D. NEMA MG 00001 - Motors and Generators; 2024.

E. NFPA 30 - Flammable and Combustible Liquids Code; 2027, with Amendment (2026).

F. NFPA 37 - Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines; 2024, with Amendment.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. NFPA 99 - Health Care Facilities Code; 2024, with Errata.

I. NFPA 110 - Standard for Emergency and Standby Power Systems; 2025.

J. UL 142 - Steel Aboveground Tanks for Flammable and Combustible Liquids; Current Edition, Including All Revisions.

K. UL 1236 - Battery Chargers for Charging Engine-Starter Batteries; Current Edition, Including All Revisions.

L. UL 2200 - Stationary Engine Generator Assemblies; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate compatibility of generator sets to be installed with work provided under other sections or by others.
      a. Transfer Switches: See Section 26 3600.
   2. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment or other potential obstructions within the spaces dedicated for engine generator system.
   3. Coordinate arrangement of equipment with the dimensions and clearance requirements of the actual equipment to be installed.

4. Coordinate the work to provide electrical circuits suitable for the power requirements of the actual auxiliary equipment and accessories to be installed.
5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Preinstallation Meeting: Convene one week before starting work of this section; require attendance of all affected installers.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition requirements, and installed features. Include alternator starting capabilities, engine fuel consumption rates, and cooling, combustion air, and exhaust requirements.
1. Include generator set sound level test data.
2. Include characteristic trip curves for overcurrent protective devices upon request.
3. Include alternator thermal damage curve upon request.

C. Shop Drawings: Include dimensioned plan views and sections indicating locations of system components, required clearances, and field connection locations. Include system interconnection schematic diagrams showing all factory and field connections.

D. Derating Calculations: Indicate ratings adjusted for applicable service conditions.

E. Fuel Storage Tank Calculations: Indicate maximum running time for generator set configuration provided.

F. Specimen Warranty: Submit sample of manufacturer's warranty.

G. Evidence of qualifications for installer.

H. Evidence of qualifications for maintenance contractor (if different entity from installer).

I. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.

J. Manufacturer's factory emissions certification.

K. Manufacturer's certification that products meet or exceed specified requirements.

L. Source quality control test reports.

M. Provide NFPA 110 required documentation from manufacturer where requested by authorities having jurisdiction, including but not limited to:
1. Certified prototype tests.
2. Torsional vibration compatibility certification.
3. NFPA 110 compliance certification.
4. Certified rated load test at rated power factor.

N. Manufacturer’s detailed field testing procedures.

O. Field quality control test reports.

P. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.
1. Include contact information for entity that will be providing contract maintenance and trouble call-back service.

Q. Executed Warranty: Submit documentation of final executed warranty completed in Owner's name and registered with manufacturer.

R. Maintenance contracts.

S. Project Record Documents: Record actual locations of system components, installed circuiting arrangements and routing, and final equipment settings.

T. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Filter Elements: One of each type, including fuel, oil and air.

1.06 QUALITY ASSURANCE

A. Comply with the following:
   1. NFPA 70 (National Electrical Code).
   2. NFPA 110 (Standard for Emergency and Standby Power Systems); meet requirements for Level 1 system.
   3. NFPA 37 (Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines).
   4. NFPA 30 (Flammable and Combustible Liquids Code).

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
   1. Authorized service facilities located within 200 miles of project site.

D. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience with engine generator systems of similar size, type, and complexity; manufacturer's authorized installer.

E. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.
   1. Contract maintenance office located within 200 miles of project site.

F. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store generator sets in accordance with manufacturer's instructions and NECA/EGSA 404.

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 instructions to avoid damage to generator set components, enclosure, and finish.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

A. See Section 01 7800 - 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

2.01 MANUFACTURERS

A. Packaged Engine Generator Set - Basis of Design: Cummins.

B. Packaged Engine Generator Set - Other Acceptable Manufacturers:
   1. Caterpillar Inc: www.cat.com/#sle.
   2. Cummins Power Generation Inc: www.cumminspower.com/#sle.
   3. Kohler Co: www.kohlerpower.com/#sle.

C. Products other than basis of design are subject to compliance with specified requirements and prior approval of Engineer. By using products other than basis of design, Contractor accepts responsibility for costs associated with any necessary modifications to related work, including any design fees.

D. Source Limitations: Furnish engine generator sets and associated components and accessories produced by a single manufacturer and obtained from a single supplier.

2.02 PACKAGED ENGINE GENERATOR SYSTEM

A. Provide new engine generator system consisting of all required equipment, sensors, conduit, boxes, wiring, piping, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. System Description:
   1. Application: Emergency/standby.
   2. Configuration: Single packaged engine generator set operated independently (not in parallel).

D. Packaged Engine Generator Set:
   1. Type: Diesel (compression ignition).
   2. Power Rating: As indicated on drawings, standby.
   3. Voltage: As indicated on drawings.
   4. Main Line Circuit Breaker:
      a. Type: Thermal magnetic.
      b. Trip Rating: Select according to generator set rating.

E. Generator Set General Requirements:
   1. Prototype tested in accordance with NFPA 110 for Level 1 systems.
   2. Factory-assembled, with components mounted on suitable base.
   3. List and label engine generator assembly as complying with UL 2200.
   4. Power Factor: Unless otherwise indicated, specified power ratings are at 0.8 power factor for three phase voltages and 1.0 power factor for single phase voltages.
   5. Provide suitable guards to protect personnel from accidental contact with rotating parts, hot piping, and other potential sources of injury.
   6. Main Line Circuit Breakers: Provide factory-installed line side connections with suitable lugs for load side connections.

F. Service Conditions: Provide engine generator system and associated components suitable for operation under the service conditions at the installed location.

G. Starting and Load Acceptance Requirements:
   1. Cranking Method: Cycle cranking complying with NFPA 110 (15 second crank period, followed by 15 second rest period, with cranking limiter time-out after 3 cycles), unless otherwise required.

2. Cranking Limiter Time-Out: If generator set fails to start after specified cranking period, indicate overcrank alarm condition and lock-out generator set from further cranking until manually reset.
3. Start Time: Capable of starting and achieving conditions necessary for load acceptance within 10 seconds (NFPA 110, Type 10).
4. Maximum Load Step: Supports 100 percent of rated load in one step.

H. Exhaust Emissions Requirements:
1. Comply with federal (EPA), state, and local regulations applicable at the time of commissioning; include factory emissions certification with submittals.
2. Do not make modifications affecting generator set factory emissions certification without approval of manufacturer and Engineer. Where such modifications are made, provide field emissions testing as necessary for certification.

2.03 ENGINE AND ENGINE ACCESSORY EQUIPMENT

A. Provide engine with adequate horsepower to achieve specified power output at rated speed, accounting for alternator efficiency and parasitic loads.

B. Engine Fuel System - Diesel (Compression Ignition):
1. Fuel Source: Diesel, ASTM D975 No. 2-D or approved cold weather diesel blends.
2. Fuel Storage: Sub-base fuel tank.
3. Engine Fuel Supply: Provide engine-driven, positive displacement fuel pump with replaceable fuel filter(s), water separator, check valve to secure prime, manual fuel priming pump, and relief-bypass valve. Provide fuel cooler where recommended by manufacturer.
4. Engine Fuel Connections: Provide suitable, approved flexible fuel lines for coupling engine to fuel source.
5. Sub-Base Fuel Tank:
a. Provide sub-base mounted, double-wall fuel tank with secondary containment; listed and labeled as complying with UL 142.
b. Tank Capacity: Size for minimum of 24 hours of continuous engine generator operation at 100 percent rated load, but not larger than permissible by applicable codes.
c. Features:
1) Direct reading fuel level gauge.
2) Normal atmospheric vent.
3) Emergency pressure relief vent.
4) Fuel fill opening with lockable cap.
5) Dedicated electrical conduit stub-up area.
6) Low fuel level switch.

C. Engine Starting System:
1. System Type: Electric, with DC solenoid-activated starting motor(s).
2. Battery(s):
a. Battery Type: Lead-acid.
b. Battery Capacity: Size according to manufacturer's recommendations for achieving starting and load acceptance requirements under worst case ambient temperature; capable of providing cranking through two complete periods of cranking limiter time-outs without recharging.
c. Provide battery rack, cables, and connectors suitable for the supplied battery(s); size battery cables according to manufacturer's recommendations for cable length to be installed.
3. Battery-Charging Alternator: Engine-driven, with integral solid-state voltage regulation.

4. Battery Charger:
    a. Provide dual rate battery charger with automatic float and equalize charging modes and minimum rating of 10 amps; suitable for maintaining the supplied battery(s) at full charge without manual intervention.
    b. Capable of returning supplied battery(s) from fully discharged to fully charged condition within 24 hours, as required by NFPA 110 for Level 1 applications while carrying normal loads.
    c. Recognized as complying with UL 1236.
    d. Furnished with integral overcurrent protection; current limited to protect charger during engine cranking; reverse polarity protection.
    e. Provide integral DC output ammeter and voltmeter with five percent accuracy.
    f. Provide alarm output contacts as necessary for alarm indications.

D. Engine Speed Control System (Governor):
1. Single Engine Generator Sets (Not Operated in Parallel): Provide electronic isochronous governor for controlling engine speed/alternator frequency.
2. Frequency Regulation, Electronic Isochronous Governors: No change in frequency from no load to full load; plus/minus 0.25 percent at steady state.

E. Engine Lubrication System:
1. System Type: Full pressure, with engine-driven, positive displacement lubrication oil pump, replaceable full-flow oil filter(s), and dip-stick for oil level indication. Provide oil cooler where recommended by manufacturer.

F. Engine Cooling System:
1. System Type: Closed-loop, liquid-cooled, with unit-mounted radiator/fan and engine-driven coolant pump; suitable for providing adequate cooling while operating at full load under worst case ambient temperature.
2. Fan Guard: Provide suitable guard to protect personnel from accidental contact with fan.
3. Coolant Heater: Provide thermostatically controlled coolant heater to improve starting under cold ambient conditions; size according to manufacturer's recommendations for achieving starting and load acceptance requirements under worst case ambient temperature.

G. Engine Air Intake and Exhaust System:
1. Air Intake Filtration: Provide engine-mounted, replaceable, dry element filter.
2. Engine Exhaust Connection: Provide suitable, approved flexible connector for coupling engine to exhaust system.
3. Exhaust Silencer: Provide critical grade or better exhaust silencer with sound attenuation not less than basis of design; select according to manufacturer's recommendations to meet sound performance requirements, where specified.

2.04 ALTERNATOR (GENERATOR)

A. Alternator: 4-pole, 1800 rpm (60 Hz output) revolving field, synchronous generator complying with NEMA MG 00001; connected to engine with flexible coupling; voltage output configuration as indicated, with reconnectable leads for 3 phase alternators.

B. Exciter:
1. Exciter Type: Brushless; provide permanent magnet generator (PMG) excitation system; self-excited (shunt) systems are not permitted.
2. PMG Excitation Short-Circuit Current Support: Capable of sustaining 300 percent of rated output current for 10 seconds.
3. Voltage Regulation (with PMG excitation): Plus/minus 0.5 percent for any constant load from no load to full load.

C. Temperature Rise: Comply with UL 2200.

D. Insulation System: NEMA MG 00001, Class H; suitable for alternator temperature rise.

E. Enclosure: NEMA MG 00001, drip-proof.

F. Total Harmonic Distortion: Not greater than five percent.

G. Alternator Heater: Provide strip heater to prevent moisture condensation on alternator windings.

2.05 GENERATOR SET CONTROL SYSTEM

A. Provide microprocessor-based control system for automatic control, monitoring, and protection of generator set. Include sensors, wiring, and connections necessary for functions/indications specified.

B. Control Panel:
   1. Control Panel Mounting: Unit-mounted unless otherwise indicated; vibration isolated.
   2. Generator Set Control Functions:
      a. Automatic Mode: Initiates generator set start/shutdown upon receiving corresponding signal from remote device (e.g. automatic transfer switch).
      b. Manual Mode: Initiates generator set start/shutdown upon direction from operator.
      c. Reset Mode: Clears all faults, allowing generator set restart after a shutdown.
      d. Emergency Stop: Immediately shuts down generator set (without time delay) and prevents automatic restarting until manually reset.
      e. Cycle Cranking: Programmable crank time, rest time, and number of cycles.
      f. Time Delay: Programmable for shutdown (engine cooldown) and start (engine warmup).
      g. Voltage Adjustment: Adjustable through range of plus/minus 5 percent.
   3. Generator Set Status Indications:
      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 (W/kW).
      e. Reactive power (VAR/kVAR).
      f. Apparent power (VA/kVA).
      g. Power factor.
      h. Duty Level: Actual load as percentage of rated power.
      i. Engine speed (RPM).
      j. Battery voltage (Volts DC).
      k. Engine oil pressure.
      l. Engine coolant temperature.
      m. Engine run time.
      n. Generator powering load (position signal from transfer switch).
   4. Generator Set Protection and Warning/Shutdown Indications:
      a. Comply with NFPA 110; configurable for NFPA 110 Level 1 or Level 2, or NFPA 99 systems including but not limited to the following protections/indications:
         1) Overcrank (shutdown).
         2) Low coolant temperature (warning).
         3) High coolant temperature (warning).
         4) High coolant temperature (shutdown).
         5) Low oil pressure (shutdown).
         6) Overspeed (shutdown).
         7) Low fuel level (warning).
         8) Low coolant level (warning/shutdown).

9) Generator control not in automatic mode (warning).
10) High battery voltage (warning).
11) Low cranking voltage (warning).
12) Low battery voltage (warning).
13) Battery charger failure (warning).

b. In addition to NFPA 110 requirements, provide the following protections/indications:
1) High AC voltage (shutdown).
2) Low AC voltage (shutdown).
3) High frequency (shutdown).
4) Low frequency (shutdown).
5) Overcurrent (shutdown).

c. Provide contacts for local and remote common alarm.
d. Provide lamp test function that illuminates all indicator lamps.

5. Other Control Panel Features:
a. Event log.
b. Communications Capability: Compatible with system indicated. Provide all accessories necessary for proper interface.
c. Remote monitoring capability via PC.

C. Remote Annunciator:
1. Remote Annunciator Mounting: Wall-mounted; Provide flush-mounted annunciator for finished areas and surface-mounted annunciator for non-finished areas unless otherwise indicated.
2. Generator Set Status Indications:
a. Generator powering load (via position signal from transfer switch).
b. Communication functional.
3. Generator Set Warning/Shutdown Indications:
a. Comply with NFPA 110; configurable for NFPA 110 Level 1 or Level 2, or NFPA 99 systems including but not limited to the following indications:
1) Overcrank (shutdown).
2) Low coolant temperature (warning).
3) High coolant temperature (warning).
4) High coolant temperature (shutdown).
5) Low oil pressure (shutdown).
6) Overspeed (shutdown).
7) Low fuel level (warning).
8) Low coolant level (warning/shutdown).
9) Generator control not in automatic mode (warning).
10) High battery voltage (warning).
11) Low cranking voltage (warning).
12) Low battery voltage (warning).
13) Battery charger failure (warning).
b. Provide audible alarm with silence function.
c. Provide lamp test function that illuminates all indicator lamps.

D. Remote Emergency Stop: Provide approved red, mushroom style remote emergency stop button where indicated or required by authorities having jurisdiction.

2.06 GENERATOR SET ENCLOSURE

A. Enclosure Type: Sound attenuating, weather protective.

B. Enclosure Material: Steel or aluminum.

C. Hardware Material: Stainless steel.

D. Color: Manufacturer's standard.

E. Access Doors: Lockable, with all locks keyed alike.

F. Openings: Designed to prevent bird/rodent entry.

G. External Drains: Extend oil and coolant drain lines to exterior of enclosure for maintenance service.

H. Sound Attenuating Enclosures: Line enclosure with non-hydroscopic, self-extinguishing sound-attenuating material.

I. Utilize an upward discharging radiator hood.

J. Exhaust Silencers: Where exhaust silencers are mounted within enclosure in main engine compartment, insulate silencer to minimize heat dissipation as necessary for operation at rated load under worst case ambient temperature.

2.07 SOURCE QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Perform production tests on generator sets at factory to verify operation and performance characteristics prior to shipment. Include certified test report with submittals.

C. Generator Set production testing to include, at a minimum:
   1. Operation at rated load and rated power factor.
   2. Single step load pick-up.
   3. Transient and steady state voltage and frequency performance.
   4. Operation of safety shutdowns.

D. Diesel Fuel Storage Tanks: Perform pressurized leak test prior to shipment.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of generator sets and auxiliary equipment are consistent with the indicated requirements.

C. Verify that rough-ins for field connections are in the proper locations.

D. Verify that mounting surfaces are ready to receive equipment.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install generator sets and associated accessories in accordance with NECA/EGSA 404.

D. Arrange equipment to provide minimum clearances and required maintenance access.

E. Unless otherwise indicated, mount generator set on properly sized, minimum 6 inch high concrete pad constructed in accordance with Section 03 3000.

F. Provide required support and attachment in accordance with Section 26 0529.

G. Provide required vibration isolation and/or seismic controls in accordance with Section 26 0548.

H. Use manufacturer's recommended oil and coolant, suitable for the worst case ambient temperatures.

I. Provide grounding and bonding in accordance with Section 26 0526.

J. Identify system wiring and components in accordance with Section 26 0553.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Provide services of a manufacturer's authorized representative to prepare and start systems and perform inspection and testing. Include manufacturer's detailed testing procedures and field reports with submittals.

C. Notify Owner and Architect at least two weeks prior to scheduled inspections and tests.

D. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

E. Provide all equipment, tools, and supplies required to accomplish inspection and testing, including load bank and fuel.

F. Preliminary inspection and testing to include, at a minimum:
   1. Inspect each system component for damage and defects.
   2. Verify tightness of mechanical and electrical connections are according to manufacturer's recommended torque settings.
   3. Check for proper oil and coolant levels.

G. Prepare and start system in accordance with manufacturer's instructions.

H. Perform acceptance test in accordance with NFPA 110.

I. Inspection and testing to include, at a minimum:
   1. Verify compliance with starting and load acceptance requirements.
   2. Verify voltage and frequency; make required adjustments as necessary.
   3. Verify phase sequence.
   4. Verify control system operation, including safety shutdowns.
   5. Verify operation of auxiliary equipment and accessories (e.g. battery charger, heaters, etc.).
   6. Perform load tests in accordance with NFPA 110 (1.5 hour building load test followed by 2 hour full load test).

J. Provide field emissions testing where necessary for certification.

K. Sound Level Tests: Measure sound levels for compliance with specified requirements. Identify and report ambient noise conditions.

L. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

M. Submit detailed reports indicating inspection and testing results and corrective actions taken.

3.04 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.05 CLOSEOUT ACTIVITIES

A. See Section 01 7900 - Demonstration and Training, for additional requirements.

B. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.

C. Training: Train Owner's personnel on operation, adjustment, and maintenance of system.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Provide minimum of four hours of training.
   3. Instructor: Manufacturer's authorized representative.

4. Location: At project site.

D. After successful acceptance test and just prior to Substantial Completion, replace air, oil, and fuel filters and fill fuel storage tank.

3.06 PROTECTION

A. Protect installed engine generator system from subsequent construction operations.

3.07 MAINTENANCE

A. Provide to Owner a proposal as an alternate to the base bid, a separate maintenance contract for the service and maintenance of engine generator system for two years from date of Substantial Completion; Include a complete description of preventive maintenance, systematic examination, adjustment, inspection, and testing, with a detailed schedule.

B. Conduct site visit at least once every three months to perform inspection, testing, and preventive maintenance. Submit report to Owner indicating maintenance performed along with evaluations and recommendations.

C. Provide trouble call-back service upon notification by Owner:
   1. Provide on-site response within 4 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.

D. Maintain an on-site log 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.

END OF SECTION

SECTION 26 3600
TRANSFER SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Transfer switches for low-voltage (600 V and less) applications and associated accessories:
   1. Automatic transfer switches.
   2. Nonautomatic transfer switches.
   3. Manual transfer switches.
   4. Remote annunciators.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 14 2100 - Electric Traction Elevators: For interface with transfer switch.

C. Section 14 2400 - Hydraulic Elevators: For interface with transfer switch.

D. Section 26 0526 - Grounding and Bonding for Electrical Systems.

E. Section 26 0529 - Hangers and Supports for Electrical Systems.

F. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

G. Section 26 3213 - Engine Generators: For interface with transfer switches.
   1. Includes code requirements applicable to work of this section.
   2. Includes additional testing requirements.
   3. Includes related demonstration and training requirements.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

B. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

C. NEMA IA 10042-1 - Industrial Control and Systems Part 1: Electromechanical AC Transfer Switch Equipment; 2025.

D. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. NFPA 110 - Standard for Emergency and Standby Power Systems; 2025.

G. UL 1008 - Transfer Switch Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate compatibility of transfer switches to be installed with work provided under other sections or by others.
      a. Engine Generators: See Section 26 3213.
   2. 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.
   3. Coordinate arrangement of equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   4. Coordinate the work with placement of supports, anchors, etc. required for mounting.

5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Preinstallation Meeting: Convene one week before starting work of this section; require attendance of all affected installers.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition requirements, and installed features.
   1. Where applicable, include characteristic trip curves for overcurrent protective devices upon request.

C. Shop Drawings: Include dimensioned plan views and sections indicating locations of system components, required clearances, and field connection locations. Include system interconnection schematic diagrams showing all factory and field connections.
   1. Clearly indicate whether proposed short circuit current ratings are based on testing with specific overcurrent protective devices or time durations; indicate short-time ratings where applicable.

D. Specimen Warranty: Submit sample of manufacturer's warranty.

E. Evidence of qualifications for installer.

F. Evidence of qualifications for maintenance contractor (if different entity from installer).

G. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.

H. Manufacturer's certification that products meet or exceed specified requirements.

I. Source quality control test reports.

J. Manufacturer’s detailed field testing procedures.

K. Field quality control test reports.

L. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.
   1. Include contact information for entity that will be providing contract maintenance and trouble call-back service.

M. Executed Warranty: Submit documentation of final executed warranty completed in Owner's name and registered with manufacturer.

N. Maintenance contracts.

O. Project Record Documents: Record actual locations of system components, installed circuiting arrangements and routing, and final equipment settings.

1.06 QUALITY ASSURANCE

A. Comply with the following:
   1. NFPA 70 (National Electrical Code).
   2. NFPA 110 (Standard for Emergency and Standby Power Systems); meet requirements for system Level specified in Section 26 3213.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
   1. Authorized service facilities located within 200 miles of project site.

D. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience with power transfer systems of similar size, type, and complexity; manufacturer's authorized installer.

E. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.
   1. Contract maintenance office located within 200 miles of project site.

F. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store transfer switches in accordance with manufacturer's instructions.

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 instructions to avoid damage to transfer switch components, enclosure, and finish.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

A. See Section 01 7800 - 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

2.01 MANUFACTURERS

A. Transfer Switches:
   1. ABB: www.electrification.us.abb.com/#sle.
   2. Eaton Corporation: www.eaton.com/#sle.
   3. Schneider Electric; ASCO Power Technologies: www.ascopower.com/#sle.
   4. Thomson Power Systems: www.thomsonps.com/#sle.
   5. Source Limitations: Provide transfer switches and accessories produced by single manufacturer and obtained from single supplier.

2.02 TRANSFER SWITCHES

A. Provide complete power transfer system consisting of all required equipment, conduit, boxes, wiring, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Applications:
   1. Utilize open transition transfer unless otherwise indicated or required.
   2. Neutral Switching (Single Phase, Three Wire and Three Phase, Four Wire Systems):
      a. Unless otherwise indicated or required, provide neutral switching:
         1) For systems with ground fault protection.

2) Where the alternate/emergency source is a separately derived system.

3. Provide signal before transfer contacts for transfer switches serving elevators.

D. Construction Type: Either "contactor type" (open contact) or "breaker type" (enclosed contact) transfer switches complying with specified requirements are acceptable.

E. Automatic Transfer Switch:
1. Transfer Switch Type: Automatic transfer switch.
2. Transition Configuration: Open-transition (no neutral position).
3. Voltage: As indicated on the drawings.
4. Ampere Rating: As indicated on the drawings.
5. Neutral Configuration: Switched neutral.
6. Load Served: As indicated on the drawings.
7. Primary Source: As indicated on the drawings.
8. Alternate Source: As indicated on the drawings.

F. Manual Transfer Switch:
1. Voltage: As indicated on the drawings.
2. Ampere Rating: As indicated on the drawings.
3. Neutral Configuration: As indicated on the drawings.
4. Load Served: As indicated on the drawings.
5. Primary Source: As indicated on the drawings.
6. Alternate Source: As indicated on the drawings.

G. Comply with NEMA IA 10042-1, and list and label as complying with UL 1008 for the classification of the intended application (e.g. emergency, optional standby).

H. Do not use double throw safety switches or other equipment not specifically designed for power transfer applications and listed as transfer switch equipment.

I. Load Classification: Classified for total system load (any combination of motor, electric discharge lamp, resistive, and tungsten lamp loads with tungsten lamp loads not exceeding 30 percent of the continuous current rating) unless otherwise indicated or required.

J. Switching Methods:
1. Open Transition:
a. Provide break-before-make transfer without a neutral position that is not connected to either source, and with interlocks to prevent simultaneous connection of the load to both sources.
2. Neutral Switching: Either simultaneously switched neutral (break-before-make) or overlapping neutral (make-before-break) methods are acceptable.
3. Obtain control power for transfer operation from line side of source to which the load is to be transferred.

K. Service Conditions: Provide transfer switches suitable for continuous operation at indicated ratings under the service conditions at the installed location.

L. Enclosures:
1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
a. Outdoor Locations: Type 3R or Type 4.
2. Provide lockable door(s) for outdoor locations.
3. Finish: Manufacturer's standard unless otherwise indicated.

M. Short Circuit Current Rating:

N. Automatic Transfer Switches:

1. Description: Transfer switches with automatically initiated transfer between sources; electrically operated and mechanically held.
2. Control Functions:
   a. Automatic mode.
   b. Test Mode: Simulates failure of primary/normal source.
   c. Voltage and Frequency Sensing:
      1) Undervoltage sensing for each phase of primary/normal source; adjustable dropout/pickup settings.
      2) Undervoltage sensing for alternate/emergency source; adjustable dropout/pickup settings.
      3) Underfrequency sensing for alternate/emergency source; adjustable dropout/pickup settings.
   d. Outputs:
      1) Contacts for engine start/shutdown (except where direct generator communication interface is provided).
      2) Auxiliary contacts; one set(s) for each switch position.
   e. Adjustable Time Delays:
      1) Engine generator start time delay; delays engine start signal to override momentary primary/normal source failures.
      2) Transfer to alternate/emergency source time delay.
      3) Retransfer to primary/normal source time delay.
      4) Engine generator cooldown time delay; delays engine shutdown following retransfer to primary/normal source to permit generator to run unloaded for cooldown period.
   f. In-Phase Monitor (Open Transition Transfer Switches): Monitors phase angle difference between sources for initiating in-phase transfer.
   g. Engine Exerciser: Provides programmable scheduled exercising of engine generator selectable with or without transfer to load; provides memory retention during power outage.
3. Status Indications:
   a. Connected to alternate/emergency source.
   b. Connected to primary/normal source.
   c. Alternate/emergency source available.
   d. Primary/normal source available.
4. Other Features:
   a. Event log.
   b. Communications Capability: Compatible with system indicated. Provide all accessories necessary for proper interface.
   c. Remote monitoring capability via PC.
5. Automatic Sequence of Operations:
   a. Upon failure of primary/normal source for a programmable time period (engine generator start time delay), initiate starting of engine generator where applicable.
   b. When alternate/emergency source is available, transfer load to alternate/emergency source after programmable time delay.
   c. When primary/normal source has been restored, retransfer to primary/normal source after a programmable time delay. Bypass time delay if alternate/emergency source fails and primary/normal source is available.
   d. Where applicable, initiate shutdown of engine generator after programmable engine cooldown time delay.

O. Nonautomatic Transfer Switches:

1. Description: Transfer switches with manually initiated transfer between sources; electrically operated and mechanically held.
2. Control Functions:
   a. Manual source selection.
   b. Outputs:
      1) Auxiliary contacts; one set for each switch position.
3. Status Indications:
   a. Connected to alternate/emergency source.
   b. Connected to primary/normal source.
   c. Alternate/emergency source available.

P. Manual Transfer Switches:
1. Description: Transfer switches with manually initiated transfer between sources; mechanically operated and mechanically held.

Q. Remote Annunciators:
1. Remote Annunciator Mounting: Wall-mounted; Provide flush-mounted annunciator for finished areas and surface-mounted annunciator for non-finished areas unless otherwise indicated.
2. Transfer Switch Status Indications:
   a. Connected to alternate/emergency source.
   b. Connected to primary/normal source.
   c. Alternate/emergency source available.
   d. Primary/normal source available.

R. Interface with Other Work:
1. Interface with engine generators as specified in Section 26 3213.
2. Interface with elevators as specified in Section 14 2100 and 14 2400.

2.03 SOURCE QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Perform production tests on transfer switches at factory to verify operation and performance characteristics prior to shipment. Include certified test report with submittals.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of transfer switches are consistent with the indicated requirements.

C. Verify that rough-ins for field connections are in the proper locations.

D. Verify that mounting surfaces are ready to receive transfer switches.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Arrange equipment to provide minimum clearances and required maintenance access.

D. Provide required support and attachment in accordance with Section 26 0529.

E. Install transfer switches plumb and level.

F. Unless otherwise indicated, mount floor-mounted transfer switches on properly sized 3 inch high concrete pad constructed in accordance with Section 03 3000.

G. Provide grounding and bonding in accordance with Section 26 0526.

H. Identify transfer switches and associated system wiring in accordance with Section 26 0553.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Provide services of a manufacturer's authorized representative to observe installation and assist in inspection and testing. Include manufacturer's detailed testing procedures and field reports with submittals.

C. Prepare and start system in accordance with manufacturer's instructions.

D. Automatic Transfer Switches:
   1. Inspect and test in accordance with NETA ATS, except Section 4.
   2. Perform inspections and tests listed in NETA ATS, Section 7.22.3. The insulation-resistance tests listed as optional are not required.

E. Provide additional inspection and testing as required for completion of associated engine generator testing as specified in Section 26 3213.

F. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

G. Submit detailed reports indicating inspection and testing results and corrective actions taken.

3.04 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.05 CLOSEOUT ACTIVITIES

A. See Section 01 7900 - Demonstration and Training, for additional requirements.

B. Demonstration: Demonstrate proper operation of transfer switches to Owner, and correct deficiencies or make adjustments as directed.

C. Training: Train Owner's personnel on operation, adjustment, and maintenance of transfer switches.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

3.06 PROTECTION

A. Protect installed transfer switches from subsequent construction operations.

3.07 MAINTENANCE

A. See Section 01 7000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

B. Provide to Owner a proposal as an alternate to the base bid, a separate maintenance contract for the service and maintenance of transfer switches for two years from date of Substantial Completion; Include a complete description of preventive maintenance, systematic examination, adjustment, inspection, and testing, with a detailed schedule.

C. Conduct site visit at least once every three months to perform inspection, testing, and preventive maintenance. Submit report to Owner indicating maintenance performed along with evaluations and recommendations.

D. Provide trouble call-back service upon notification by Owner:
   1. Provide on-site response within 4 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. Maintain an on-site log 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.

END OF SECTION

SECTION 26 4200
CATHODIC PROTECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes passive cathodic protection systems that use [magnesium] [zinc] anodes to protect iron and steel piping.

1.03 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design, supervise, test, and inspect the installation of cathodic protection systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
   1. Design cathodic protection for pipelines according to NACE RP0169.

B. Survey site and determine soil or water corrosivity (resistivity), current requirements, potential surveys, stray currents, and water chemistry/corrosivity (pH).

C. Select anodes and accessories relevant to level of protection. Design anodes for an estimated life of 30 years before replacement.

D. Cathodic protection systems shall provide protective potential that complies with referenced NACE standards. Insulators are required if needed to insulate protected metals from other structures.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For cathodic protection. Include plans, evaluations, sections, details, and attachments to other work.
   1. Detail locations of cathodic protection equipment, devices, and outlets, with characteristics and cross-references to products.
   2. Include calculations and details of anode designs.
   3. Include labeling and identifying scheme for wires, cables, and test boxes.

C. Delegated-Design Submittal: For cathodic protection system indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified corrosion engineer responsible for their preparation.
   1. Conduct site tests necessary for design, including soil resistivity, close-interval potential surveys, testing during construction, interference testing, and training of Owner's personnel.
   2. Provide system design calculations, stating the maximum recommended anode current output density, and the rate of gaseous production, if any, at that current density.

1.05 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, and coordinating connections to piping.

B. Qualification Data: For qualified professional engineer. Submit evidence of current license, corporate authorization (if applicable) of the engineering business, and NACE certifications.

C. Field quality-control reports.

D. Warranty: Sample of special warranty.

1.06 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: In addition to items specified in Section 01 7823 "Operation and Maintenance Data," include the following:
   1. Basic system operation, outlining the step-by-step procedures required for system startup, operation, adjustment of current flow, and shutdown.
   2. Instructions for pipe-to-reference cell and tank-to-reference cell potential measurements and frequency of monitoring.
   3. Instructions for dielectric connections, interference and sacrificial-anode bonds; and precautions to ensure safe conditions during repair of pipe, tank or other metallic systems. Instructions shall be neatly bound.
   4. Locations of all anodes, test stations, and insulating joints.
   5. Structure-to-reference cell potentials as measured during the tests required by "Field Quality Control" Article.
   6. Recommendations for maintenance testing, including instructions for pipe-to-reference cell potential measurements and frequency of testing.
   7. Precautions to ensure safe conditions during repair of pipe system.

1.07 QUALITY ASSURANCE

A. Corrosion Engineer Qualifications: A qualified professional engineer who has education and experience in cathodic protection of buried and submerged metal structures and has NACE accreditation or certification as a Corrosion Specialist or Cathodic Protection Specialist.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Protect anodes from exposure to rain and direct sunlight.

1.09 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace permanent reference electrodes that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: 30 years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MAGNESIUM ANODES, TYPE II

A. Comply with ASTM B 843.

B. Chemical composition as percent of weight shall be as follows:
   1. Aluminum: 0.010 maximum.
   2. Manganese: 0.50 to 1.3.
   3. Zinc: 0.05 maximum.
   4. Silicon: 0.50 maximum.
   5. Copper: 0.02 maximum.
   6. Nickel: 0.001 maximum.
   7. Iron: 0.03 maximum.
   8. Other Impurities: 0.05 each; 0.3 maximum total.
   9. Magnesium: Remainder.

C. Anode Core: Galvanized steel with anode wire silver-soldered to the core. Connection shall be recessed and epoxy insulated for 600-V rating. Connection shall be covered with heat-shrinkable tubing, and insulation shall be extended over connection.

D. Anode Wires: Factory-installed cables, with copper conductors, suitable for direct burial; not less than No. 10 AWG with Type THWN insulation according to ASTM D 1248 and NEMA WC 70/ICEA S-95-658; long enough to extend to accompanying junction box without splicing.

E. Anode Backfill: Backfill materials packaged in water-permeable fabric sack or cardboard container. Anodes shall be factory installed in packaged backfill using methods that result in dense packing of fill with factory-installed anode spacers to ensure centering of anode in packaged anode backfill. Backfill material shall have the following chemical composition by weight:
   1. Hydrated Gypsum: 75 percent.
   2. Bentonite Clay: 20 percent.
   3. Anhydrous Sodium Sulfate: 5 percent.

2.02 MAGNESIUM/MANGANESE ALLOY ANODES

A. Chemical composition as percent of weight shall be as follows:
   1. Aluminum: 0.01 maximum.
   2. Manganese: 0.50 to 1.3.
   3. Copper: 0.02 maximum.
   4. Nickel: 0.001 maximum.
   5. Iron: 0.03 maximum.
   6. Other Impurities: 0.05 each; 0.3 maximum total.
   7. Magnesium: Remainder.

B. Bare Anode Weight: 40 lb, not including core, and a nominal length of 60 inches.

C. Anode Wires: Factory-installed cables, with copper conductors, suitable for direct burial; not less than No. 10 AWG with Type THWN insulation according to ASTM D 1248 and NEMA WC 70/ICEA S-95-658; long enough to extend to accompanying junction box without splicing.

D. Anode Backfill: Backfill materials packaged in water-permeable fabric sack or cardboard container. Anodes shall be factory installed in packaged backfill using methods that result in dense packing of fill with factory-installed anode spacers to ensure centering of anode in packaged anode backfill. Backfill material shall have the following chemical composition by weight:
   1. Hydrated Gypsum: 75 percent.
   2. Bentonite Clay: 20 percent.
   3. Anhydrous Sodium Sulfate: 5 percent.

2.03 ZINC ANODES FOR BURIED SERVICE, TYPE Z-1

A. Comply with ASTM B 418, Type II.

B. Chemical composition as percent of weight shall be as follows:
   1. Aluminum: 0.005 maximum.
   2. Cadmium: 0.003 maximum.
   3. Iron: 0.0014 maximum.
   4. Zinc: Remainder.

C. Bare Anode Ingot Weight: 30 lb, 2 inches square and 30 inches long. Packaged weight of anode bag shall be 70 lb.

D. Anode Wires: Factory-installed cables, with copper conductors, suitable for direct burial; not less than No. 10 AWG with Type THWN insulation according to ASTM D 1248 and NEMA WC 70/ICEA S-95-658; long enough to extend to accompanying junction box without splicing.

E. Anode Backfill: Backfill materials packaged in water-permeable fabric sack or cardboard container. Anodes shall be factory installed in packaged backfill using methods that result in dense packing of fill with factory-installed anode spacers to ensure centering of anode in packaged anode backfill. Backfill material shall have the following chemical composition by weight:

1. Hydrated Gypsum: 75 percent.
2. Bentonite Clay: 20 percent.
3. Anhydrous Sodium Sulfate: 5 percent.

2.04 PERMANENT REFERENCE ELECTRODES

A. Copper, suitable for direct burial. Electrode shall be guaranteed by supplier for 30 years' service in the installed environment.

2.05 WIRE AND CABLE

A. Anode Header Cable: Single-conductor, Type HMWPE, insulated cable specifically designed for direct-buried dc service in cathodic protection installations.
   1. Conductor: Stranded, annealed, uncoated copper, not less than No. 8 AWG, complying with ASTM B 3 and ASTM B 8.
   2. Insulation: High-molecular-weight polyethylene, complying with NEMA WC 70/ICEA S-95-658.
   3. Minimum Average Thickness of Insulation: 110 mils for Nos. 8 through 2 AWG, and 125 mils for Nos. 1 through 4/0 AWG; rated at 600 V.
   4. Connectors: Exothermic welds.

B. Conductors and Cables: Comply with requirements in Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables."
   1. Bonding Conductors for Joint and Continuity Bonds: Not less than No. 8 AWG, stranded, Type THWN copper conductors.
   2. Flexible Pipe Coupling Bonds: Flexible copper straps with electrical resistance equal to No. 1/0 AWG stranded copper wire and with five holes for five exothermic welds to pipe.
   3. Test Wires: No. 12 AWG, Type THWN copper conductors.
   4. Resistance Wires: No. 16 or No. 22 AWG nickel-chromium wire.
   5. Cables for Installation in Conduit: Type THWN copper conductors.

2.06 TEST STATIONS

A. Plastic Test Stations: Flush-mounted type, manufactured of high-impact-resistant PVC or polycarbonate with watertight conduit connections and cover and removable terminal board having at least five terminals.

B. Test Station Mounting Enclosures:
   1. Non-Traffic-Area Boxes: Comply with requirements in Section 26 0533 "Raceways and Boxes for Electrical Systems."
   2. Traffic-Area Boxes: Comply with requirements in Section 26 0543 "Underground Ducts and Raceways for Electrical Systems." Boxes shall have cast-iron covers with a welded bead legend "CP TEST."

2.07 SEALING, POTTING, AND DIELECTRIC COMPOUNDS

A. Sealing and Dielectric Insulating Compound: Comply with NACE RP0188. Black, rubber based, soft, permanently pliable, tacky, moldable, and unbacked; [0.125 inch] [0.5 inch] thick.

B. Potting Compound: Comply with NACE RP0188. Cast-epoxy, two-package type; fabricated for this purpose and covered with heat-shrinkable tape.

C. Pressure-Sensitive, Vinyl-Plastic Electrical Tape: Comply with UL 510.

2.08 EXOTHERMIC WELDING MATERIALS

A. Exothermic Weld Kits: Specifically designed by manufacturer for welding materials and shapes required.

B. Exothermic Weld Caps: Dome of high-density polyethylene, 10-mil minimum thickness, filled with mastic and containing a tunnel portion to separate lead wire from exothermic weld.

2.09 COATING REPAIR MATERIALS

A. Touchup Coating Materials: Comply with requirements in Section 09 9600 "High-Performance Coatings" for coating systems for touchup of factory-applied coatings.

B. Adhesive-Applied Coating Materials: Coating materials shall be compatible with factory-applied coating system.

1. Nominal thickness of coating materials shall be not less than [8 mils] [16 mils] [24 mils] [40 mils] [60 mils] , plus or minus 5 percent.
2. Coating materials shall be one of the following supplied by factory-applied coating system manufacturer:
   a. Polyvinyl-chloride, pressure-sensitive, adhesive tape.
   b. High-density polyethylene/bituminous rubber compound tape.
   c. Butyl rubber tape.
   d. Coal-tar epoxy.

PART 3 EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Comply with ANSI/IEEE C2 and NFPA 70.

B. Make connections to ferrous pipe using exothermic welding.

C. Coat welds with the coating repair material and apply an exothermic weld cap.

3.02 MAGNESIUM ANODE INSTALLATION

A. Install magnesium anodes at locations that clear obstructions. Install at least 36 inches and no more than 10 feet from pipe to be protected. Install in augered holes with top of anode a minimum of 36 inches below finished grade. In soils that will collapse into augered holes, use casing of galvanized sheet steel.

B. Install anodes in a dry condition after plastic or waterproof protective covering has been completely removed from water-permeable permanent container that houses anode metal. Do not use anode-connecting wire for lowering anode into hole. Backfill annular space around anode with fine earth in 6-inch layers; compact each layer using hand tools. Do not strike anode or connecting wire during backfilling and compacting. After backfilling and compacting to within 6 inches of finished grade, pour approximately 5 gal. of water into each filled hole. After water has been absorbed by earth, complete backfilling to finished level.

C. If rock strata are encountered before achieving specified augured hole depth, install anodes horizontally at depth at least as deep as bottom of pipe to be protected.

D. Install anodes spaced as indicated, connected through a test station to the pipeline, allowing slack in connecting wire to compensate for movement during backfill operation.

E. For tank protection, connect groups of anodes to collector cable. Make contact, through a test station, with tank to be protected.

F. Do not use resistance wires to reduce current output of individual or group anodes.

3.03 ZINC ANODE INSTALLATION

A. Install zinc anode horizontally in a hole at least 3 inches larger than anode. Install anode under new copper water tubing, including service lines, blowoffs, and air releases. Separate piping and anode by at least 24 inches, but not more than 60 inches.

B. Install anode midway between both ends of piping. Install anode wire in piping trench and connect to piping at an accessible location. Install anode wire in PVC conduit where rising out of the ground to the aboveground connection.

3.04 INSTALLATION OF REFERENCE ELECTRODES

A. Install directly beneath the buried metallic component being protected.

3.05 CABLE AND WIRE INSTALLATION

A. Install conductors, except anode wires, in PVC conduit with waterproof PVC junction boxes. Comply with requirements in Section 26 0533 "Raceways and Boxes for Electrical Systems" for conduit and its installation.

B. Anode Wire Installation: Cover trench bottom for the anode wire with 3-inch layer of sand or stone-free earth. Center wire on backfill layer and do not stretch or kink the conductor. Place backfill over wire in layers not exceeding 6 inches deep, and compact each layer. Use clean fill, free from roots, vegetable matter, and refuse. Place cable underground-line warning tape within 18 inches of finished grade, above cable and conduit.

C. Bonding Conductors: Install conductors on metallic pipe and tanks, to and across buried flexible couplings, mechanical joints, and flanged joints except at places where insulating joints are specified. Welded and threaded joints are considered electrically continuous and do not require bonding.
   1. Install at least two bonds between parts requiring bonding.
   2. Bonding conductors must contain sufficient slack for anticipated movement between structures. Bonding conductors across pipe joints shall have not less than a 4-inch slack for pipe expansion, contraction, and soil stress.
   3. Connect bonding conductors to pipe, coupling follower rings and coupling middle ring or sleeve. Connect bonding conductors with exothermic welds.

D. For wire splicing, use compression connectors or exothermic welds.

3.06 TEST STATIONS

A. Install test stations as follows:
   1. At 1000-foot intervals.
   2. At insulating joints.
   3. At both ends of casings when casing material is included in the cathodic protection system.
   4. Where pipe crosses other metal pipes.
   5. Where pipe connects to existing piping system.
   6. Where pipe connects to dissimilar metal pipe.
   7. At each tank component.

B. Install test stations on backfill complying with requirements for trench bottom fill for anode wires unless otherwise indicated.

C. Terminate test conductors on terminal boards and install a spare set of test leads at each testing location.

3.07 PIPE JOINTS

A. Insulating Flange Sets: Cover flanges with sealing and dielectric compound.

B. Insulating Unions: Install electrical isolation at each building entrance and at other locations indicated on approved Delegated-Design Drawings. Cover unions with sealing and dielectric compound.

3.08 INSULATING PIPE SLEEVES

A. Install insulating sleeves between metallic piping and metal buildings, hangers, supports, and other metal structures. Completely surround the metallic pipe for the full length of the steel contact and effectively prevent contact between the cathodically protected metallic pipe and other metallic structures. Support insulating sleeve to prevent damage to coating and to accommodate relative movement, vibrations, and temperature differentials.

3.09 DISSIMILAR METALS

A. Underground Dissimilar Piping: Coat insulating joint and pipe at joints of dissimilar piping material with sealing and dielectric compound for a minimum distance of 10 pipe diameters on both sides of joint.

B. Underground Dissimilar Valves: Coat dissimilar ferrous valves and pipe with sealing and dielectric compound for a minimum distance of 10 pipe diameters on both sides of valve.

C. Aboveground Dissimilar Pipe and Valves: If dissimilar metal pipe joints and valves are not buried and are exposed only to atmosphere, coat connection or valve, including pipe, with sealing and dielectric compound for a minimum distance of three pipe diameters on both sides of junction.

3.10 COATINGS

A. Field Joints: Apply adhesive-applied coating system in a thickness to achieve corrosion protection equal to adjacent factory-applied coating.

3.11 IDENTIFICATION

A. Comply with requirements in Section 26 0553 "Identification for Electrical Systems."
   1. Identify anode wires and anode header cables with marker tape.
   2. Identify underground wires and cables with underground-line warning tape.
   3. Identify text boxes with engraved, laminated acrylic or melamine label, permanently attached to text box.

3.12 FIELD QUALITY CONTROL

A. Comply with NACE RP0169 and NACE RP0285.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

C. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installation, including connections.

D. 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.

E. Tests and Inspections:
   1. Static Pull Test: Choose, at random, one completed anode of each type for this destructive test. Demonstrate that anode wire connections have enough strength to withstand a minimum tensile load of 300 lb. If test fails, replace all anodes and repeat test at another randomly selected anode.
   2. Insulation Testing: Before anode system is connected to pipe, test insulation at each insulating joint and fitting. Demonstrate that no metallic contact, or short circuit, exists between the two insulated sections of pipe. Replace defective joints or fittings.
   3. Bonding Tests: Test for electrical continuity across all bonded joints. Repair or add additional bonds until electrical continuity is achieved.
   4. Baseline Potentials: After backfilling of pipe and anodes is completed, but before anodes are connected to pipe, measure the static potential of pipe to soil. Record initial measurements.
   5. Anode Output: Measure electrical current as anodes or groups of anodes are connected to pipe. Use a low-resistance ammeter. Record current, date, time, and location of each measurement.
   6. Pipe-to-Reference Electrode Potential Measurements: On completion of installation of entire cathodic protection system, make electrode potential measurements according to NACE RP0169, using a copper/copper-sulfate reference electrode and a potentiometer-

voltmeter, or a dc voltmeter with an internal resistance (sensitivity) of not less than 100,000 ohms per volt and a full scale of 1 or 2 V. Make measurements at same locations as those used for baseline potentials. Record voltage, date, time, and location of each measurement, using one of the following two methods:

a. V Negative Voltage: With cathodic system in operation, measure a negative voltage of at least minus 0.85 V between pipe and a saturated copper/copper-sulfate reference electrode contacting the earth directly over pipe.
b. 100-mV Polarization Voltage: Determine polarization voltage shift by interrupting protective current and measuring polarization decay. An immediate voltage shift will occur if protective current is interrupted. Use voltage reading, after immediate shift, as base reading from which to measure polarization decay. Measure at least a minimum polarization voltage shift of 100 mV between pipe and a saturated copper/copper-sulfate reference electrode contacting the earth directly over pipe.

F. Location of Measurements for Piping: For coated piping or conduit, measure from reference electrode in contact with the earth directly over pipe. Measure at intervals not exceeding 400 feet. Make additional measurements at each distribution service riser, with reference electrode placed directly over service line.

G. Interference Testing: Test interference with cathodic protection from any foreign pipes in cooperation with Owner of foreign pipes. Report results and recommendations.

H. Stray Current Measurements: Perform at each test station. Mitigate stray currents due to lightning or overhead ac power transmission lines as provided for in NACE standards.

I. Inspect coatings; comply with NACE RP0188. Repair imperfections of factory-applied coatings as specified in "Coatings" Article.
1. Use electronic holiday detectors to detect coating imperfections.
2. All damage to the protective coating during transit and handling shall be repaired before installation.
3. Repair factory-applied coatings to have equal or better corrosion resistance than the factory-applied coating system. Field-repair material shall be of the type approved by, and shall be applied as recommended by, manufacturer of the coating material.

3.13 ADJUSTING

A. Adjust cathodic current using resistors as recommended by corrosion engineer who prepared the Delegated-Design Submittal in Part 1.

B. During the first year after Substantial Completion, test, inspect, and adjust cathodic protection system every three months to ensure its continued compliance with specified requirements.

3.14 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain cathodic protection system.

END OF SECTION

SECTION 26 4300
SURGE PROTECTIVE DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surge protective devices for service entrance locations.

B. Surge protective devices for distribution locations.

C. Surge protective devices for branch panelboard locations.

1.02 RELATED REQUIREMENTS

A. Section 26 0526 - Grounding and Bonding for Electrical Systems.

B. Section 26 2413 - Switchboards.

C. Section 26 2416 - Panelboards.

1.03 ABBREVIATIONS AND ACRONYMS

A. EMI/RFI: Electromagnetic Interference/Radio Frequency Interference.

B. SPD: Surge Protective Device.

1.04 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

B. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

C. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate size and location of overcurrent device compatible with the actual surge protective device and location to be installed. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to ordering equipment.

1.06 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Include detailed component information, voltage, surge current ratings, repetitive surge current capacity, voltage protection rating (VPR) for all protection modes, maximum continuous operating voltage (MCOV), nominal discharge current (I-n), short circuit current rating (SCCR), connection means including any required external overcurrent protection, enclosure ratings, outline and support point dimensions, weight, service condition requirements, and installed features.
   1. SPDs with EMI/RFI filter: Include noise attenuation performance.

C. Shop Drawings: Include wiring diagrams showing all factory and field connections with wire and circuit breaker/fuse sizes.

D. Certificates: Manufacturer's documentation of listing for compliance with the following standards:
   1. UL 1449.
   2. UL 1283 (for Type 2 SPDs).

E. Field Quality Control Test Reports.

F. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

G. Operation and Maintenance Data: Include information on status indicators and recommended maintenance procedures and intervals.

H. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

I. Project Record Documents: Record actual connections and locations of surge protective devices.

1.07 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.

1.08 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in accordance with manufacturer's written instructions.

1.09 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.10 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Manufacturer's Warranty: Provide minimum five year warranty covering repair or replacement of surge protective devices showing evidence of failure due to defective materials or workmanship.

C. Exclude surge protective devices from any clause limiting warranty responsibility for acts of nature, including lightning, stated elsewhere.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Field-Installed, Externally Mounted Surge Protective Devices:
   1. ABB: www.electrification.us.abb.com/#sle.
   2. Intermatic, Inc: www.intermatic.com/#sle.
   3. Schneider Electric: www.se.com/#sle.

B. Factory-installed, Internally Mounted Surge Protective Devices:
   1. Same as manufacturer of equipment containing surge protective device, to provide complete listed assembly including SPD.

C. Source Limitations: Provide surge protective devices produced by single manufacturer and obtained from single supplier.

2.02 SURGE PROTECTIVE DEVICES - GENERAL REQUIREMENTS

A. Description: Factory-assembled surge protective devices (SPDs) for 60 Hz service; listed, classified, and labeled as suitable for the purpose intended; system voltage as indicated on the drawings.

B. Unless otherwise indicated, provide field-installed, externally-mounted or factory-installed, internally-mouonted SPDs.

C. List and label as complying with UL 1449, Type 1 when connected on line side of service disconnect overcurrent device and Type 1 or 2 when connected on load side of service disconnect overcurrent device.

D. Protected Modes:
   1. Wye Systems: L-N, L-G, N-G, L-L.
   2. Single Split Phase Systems: L-N, L-G, N-G, L-L.
   3. High Leg Delta Systems: L-N, L-G, N-G, L-L.

E. UL 1449 Voltage Protection Ratings (VPRs):
   1. 208Y/120V System Voltage: Not more than 1,000 V for L-N, L-G, and N-G modes and 1,200 V for L-L mode.
   2. 240/120V System Voltage: Not more than 1,000 V for L-N, L-G, and N-G modes and 1,200 V for L-L mode.
   3. 480Y/277V System Voltage: Not more than 1,500 V for L-N, L-G, and N-G modes and 2,000 V for L-L mode.

F. UL 1449 Maximum Continuous Operating Voltage (MCOV): Not less than 115% of nominal system voltage.

G. Enclosure Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
   1. Indoor clean, dry locations: Type 1.

H. Mounting for Field-installed, Externally Mounted SPDs: Unless otherwise indicated, as specified for the following locations:
   1. Provide surface-mounted SPD where mounted in non-public areas or adjacent to surface-mounted equipment.
   2. Provide flush-mounted SPD where mounted in public areas or adjacent to flush-mounted equipment.

I. Equipment Containing Factory-installed, Internally Mounted SPDs: Listed and labeled as a complete assembly including SPD.
   1. Switchboards: See Section 26 2413.
   2. Panelboards: See Section 26 2416.

2.03 SURGE PROTECTIVE DEVICES FOR SERVICE ENTRANCE LOCATIONS

A. Surge Protective Device - Basis of Design: Surge Suppression, LLC (SSI); Advantage Series; Model SSLB (100 kA/phase, Type 2, I-n = 20 kA); www.surgesuppression.com/#sle.
   1. Voltage: As indicated on drawings.
   2. Features: Discrete "all-mode" protection (10 modes for 3-phase wye circuits); component-level thermal fusing; internal circuit board-mounted overcurrent fusing; 200 kAIC SCCR; 25 year warranty.
   3. Include the following options:
      a. AC11 - Advanced internal audible alarm with on, off, and test with dry relay contacts.
      b. (Only one of the following may be selected)
      c. D1 - NEMA 1, 2, 3, 3S, 4X, and 12 composite enclosure with integral non-fused disconnect switch, with external handle
      d. P - Flush mount plate.

B. Surge Protective Device - Basis of Design: Surge Suppression, LLC (SSI); SpecPRO Series; Model SSMA8 (80 kA/phase, Type 2, I-n = 10 kA); www.surgesuppression.com/#sle.
   1. Voltage: As indicated on drawings.
   2. Features: Seven modes of protection; component-level thermal fusing; internal circuit board-mounted overcurrent fusing; 200 kAIC SCCR; 15 year warranty.
   3. Include the following options:

a. AC11 - Advanced internal audible alarm with on, off, and test with dry relay contacts.
b. D1 - NEMA 1, 2, 3, 3S, 4X, and 12 composite enclosure with integral non-fused disconnect switch, with external handle
c. P - Flush mount plate.

2.04 SURGE PROTECTIVE DEVICES FOR DISTRIBUTION LOCATIONS

A. Distribution locations include SPDs connected to distribution panelboards, motor control centers, and busway.

B. Surge Protective Device - Basis of Design: Surge Suppression, LLC (SSI); Advantage Series; Model SSLA (100 kA/phase, Type 2, I-n = 10 kA); www.surgesuppression.com/#sle.
1. Voltage: As indicated on drawings.
2. Features: Discrete "all-mode" protection (10 modes for 3-phase wye circuits); component-level thermal fusing; internal circuit board-mounted overcurrent fusing; 200 kAIC SCCR; 25 year warranty.
3. Include the following options:
a. AC11 - Advanced internal audible alarm with on, off, and test with dry relay contacts.
b. D1 - NEMA 1, 2, 3, 3S, 4X, and 12 composite enclosure with integral non-fused disconnect switch, with external handle
c. P - Flush mount plate.

C. Surge Protective Device - Basis of Design: Surge Suppression, LLC (SSI); SpecPRO Series; Model SSMA8 (80 kA/phase, Type 2, I-n = 10 kA); www.surgesuppression.com/#sle.
1. Voltage: As indicated on drawings.
2. Features: Seven modes of protection; component-level thermal fusing; internal circuit board-mounted overcurrent fusing; 200 kAIC SCCR; 15 year warranty.
3. Include the following options:
a. AC11 - Advanced internal audible alarm with on, off, and test with dry relay contacts.
b. D1 - NEMA 1, 2, 3, 3S, 4X, and 12 composite enclosure with integral non-fused disconnect switch, with external handle
c. P - Flush mount plate.

2.05 SURGE PROTECTIVE DEVICES FOR BRANCH PANELBOARD LOCATIONS

A. Surge Protective Device - Basis of Design: Surge Suppression, LLC (SSI); Advantage Series; Model SSLA (100 kA/phase, Type 2, I-n = 10 kA); www.surgesuppression.com/#sle.
1. Voltage: As indicated on drawings.
2. Features: Discrete "all-mode" protection (10 modes for 3-phase wye circuits); component-level thermal fusing; internal circuit board-mounted overcurrent fusing; 200 kAIC SCCR; 25 year warranty.
3. Include the following options:
a. AC11 - Advanced internal audible alarm with on, off, and test with dry relay contacts.
b. D1 - NEMA 1, 2, 3, 3S, 4X, and 12 composite enclosure with integral non-fused disconnect switch, with external handle
c. P - Flush mount plate.

B. Surge Protective Device - Basis of Design: Surge Suppression, LLC (SSI); SpecPRO Series; Model SSMA8 (80 kA/phase, Type 2, I-n = 10 kA); www.surgesuppression.com/#sle.
1. Voltage: As indicated on drawings.
2. Features: Seven modes of protection; component-level thermal fusing; internal circuit board-mounted overcurrent fusing; 200 kAIC SCCR; 15 year warranty.
3. Include the following options:
a. AC11 - Advanced internal audible alarm with on, off, and test with dry relay contacts.
b. D1 - NEMA 1, 2, 3, 3S, 4X, and 12 composite enclosure with integral non-fused disconnect switch, with external handle

c. P - Flush mount plate.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the service voltage and configuration marked on the SPD are consistent with the service voltage and configuration at the location to be installed.

C. Verify that electrical equipment is ready to accept connection of the SPD and that installed overcurrent device is consistent with requirements of drawings and manufacturer's instructions.

D. Verify system grounding and bonding is in accordance with Section 26 0526, including bonding of neutral and ground for service entrance and separately derived systems where applicable. Do not energize SPD until deficiencies have been corrected.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

C. Unless indicated otherwise, connect service entrance surge protective device on load side of service disconnect main overcurrent device.

D. Install conductors between SPD and equipment terminations as short and straight as possible, not exceeding manufacturer's recommended maximum conductor length. Breaker locations may be reasonably rearranged in order to provide leads as short and straight as possible. Twist conductors together to reduce inductance.

E. Do not energize SPD until bonding of neutral and ground for service entrance and separately derived systems is complete in accordance with Section 26 0526 where applicable. Replace SPDs damaged by improper or missing neutral-ground bond.

F. Disconnect SPD prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPD connected.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - 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 7.19.1.

D. 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.

3.04 CLEANING

A. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 26 5100
INTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior luminaires.

B. Emergency lighting units.

C. Exit signs.

D. Ballasts and drivers.

E. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 26 0529 - Hangers and Supports for Electrical Systems.

B. Section 26 0533.16 - Boxes for Electrical Systems.

C. Section 26 0923 - Lighting Control Devices.

D. Section 26 2726 - Wiring Devices: Manual wall switches and wall dimmers.

1.03 REFERENCE STANDARDS

A. IES LM-63 - Approved Method: IES Standard File Format for the Electronic Transfer of Photometric Data and Related Information; 2019 (Reaffirmed 2025).

B. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2024.

C. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.

D. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; 2025.

E. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.

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.

1.04 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.

1.05 SUBMITTALS

A. See Section 01 3000 - 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.
   2. Provide photometric calculations where luminaires are proposed for substitution upon request.

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.
      b. Include IES LM-79 test report upon request.
   2. Provide electronic files of photometric data certified by a National Voluntary Laboratory Accreditation Program (NVLAP) lab or independent testing agency in IES LM-63 standard format upon request.
   3. Lamps: Include rated life, color temperature, color rendering index (CRI), and initial and mean lumen output.

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: Instructions for each product including information on replacement parts.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Lenses and Louvers: Two percent of total quantity installed for each type, but not less than one of each type.
   3. Extra Lamps: Ten percent of total quantity installed for each type, but not less than two of each type.

G. Project Record Documents: Record actual connections and locations of luminaires and any associated remote components.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.07 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.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide 3-year manufacturer warranty for LED luminaires, including drivers.

C. Provide 3-year manufacturer warranty for LED replacement lamps.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

B. Substitutions: See Section 01 6000 - Product Requirements.

2.02 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. 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 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

2.03 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. Accessories:
   1. Provide compatible accessory wire guards for exit signs located in gymnasiums and weight rooms. .

2.04 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.
   a. Wall Dimmers: See Section 26 2726.
   b. Daylighting Controls: See Section 26 0923.

2.05 ACCESSORIES

A. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.

B. Threaded Rods for Suspended Luminaires: Zinc-plated steel, minimum 1/4" size, field-painted as directed.

C. Provide accessory plaster frames for luminaires recessed in plaster ceilings.

D. Fire-Rated Luminaire Enclosures:
   1. Provide as required to preserve fire resistance rating of building elements.

PART 3 EXECUTION

3.01 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.

3.02 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.

3.03 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 0533.16 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 0529.

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 surface-mounted and recessed luminaires to ceiling support channels or framing members or 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 two galvanized steel safety wire(s), minimum 12 gauge, connected from opposing corners of each recessed luminaire to building structure.

7. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.

G. Recessed Luminaires:
1. Install trims tight to mounting surface with no visible light leakage.
2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.
3. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.

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 4 feet between supports.
3. Install canopies tight to mounting surface.
4. Unless otherwise indicated, support pendants from swivel hangers.

I. Install accessories furnished with each luminaire.

J. Bond products and metal accessories to branch circuit equipment grounding conductor.

K. Emergency Lighting Units:
1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

L. Exit Signs:
1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

M. Install lamps in each luminaire.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - 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. 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.

3.05 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Architect or authority having jurisdiction.

C. 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.

3.06 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.

3.07 CLOSEOUT ACTIVITIES

A. See Section 01 7900 - Demonstration and Training, for additional requirements.

B. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.

3.08 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

3.09 ATTACHMENTS

A. Luminaire schedule.

END OF SECTION

SECTION 26 5600
EXTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior luminaires.

B. Poles and accessories.

C. Luminaire accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Materials and installation requirements for concrete bases for poles.

B. Section 26 0529 - Hangers and Supports for Electrical Systems.

C. Section 26 0533.16 - Boxes for Electrical Systems.

D. Section 26 2813 - Fuses.

1.03 REFERENCE STANDARDS

A. AASHTO LTS - Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals; 2013, with Editorial Revision (2025).

B. ANSI O5.1 - American National Standard for Wood Poles: Specifications and Dimensions; 2022.

C. IEEE C2 - National Electrical Safety Code(R) (NESC(R)); 2023.

D. IES LM-63 - Approved Method: IES Standard File Format for the Electronic Transfer of Photometric Data and Related Information; 2019 (Reaffirmed 2025).

E. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2024.

F. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.

G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

H. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2000 (Reaffirmed 2006).

I. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2023.

J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. UL 1598 - Luminaires; Current Edition, Including All Revisions.

L. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.04 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.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:
   1. Provide photometric calculations where luminaires are proposed for substitution upon request.

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.
      b. Include IES LM-79 test report upon request.
   2. Provide electronic files of photometric data certified by a National Voluntary Laboratory Accreditation Program (NVLAP) lab or independent testing agency in IES LM-63 standard format upon request.
   3. 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. Field Quality Control Reports.
   1. Include test report indicating measured illumination levels.

F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

G. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Touch-Up Paint: 2 gallons, to match color of pole finish.

I. Project Record Documents: Record actual connections and locations of pole foundations, luminaires, and any pull or junction boxes.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.07 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.

C. Receive, handle, and store wood poles in accordance with ANSI O5.1.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide 2-year manufacturer warranty for all LED luminaires, including drivers.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

B. Substitutions: See Section 01 6000 - Product Requirements.

2.02 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. Recessed Luminaires:
   1. Ceiling Compatibility: Comply with NEMA LE 4.
   2. Luminaires Recessed in Sloped Ceilings: Provide suitable sloped ceiling adapters.

I. 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 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

2.03 POLES

A. Manufacturers:
   1. Acuity Brands, Inc: www.acuitybrands.com/#sle.
   2. Cooper Lighting, a division of Cooper Industries: www.cooperindustries.com/#sle.
   3. Hubbell Lighting, Inc: www.hubbelllighting.com/#sle.

B. All Poles:
   1. Provide poles and associated support components suitable for the luminaire(s) and associated supports and accessories to be installed.
   2. Structural Design Criteria:
      a. Comply with AASHTO LTS.
      b. Wind Load: Include effective projected area (EPA) of luminaire(s) and associated supports and accessories to be installed.
      c. Dead Load: Include weight of proposed luminaire(s) and associated supports and accessories.
      d. Include structural calculations demonstrating compliance with submittals.
   3. Material: Steel, unless otherwise indicated.
   4. Shape: Square straight, unless otherwise indicated.
   5. Finish: Match luminaire finish, unless otherwise indicated.
   6. Mounting: Install on concrete foundation, height as indicated on the drawings, unless otherwise indicated.
   7. Unless otherwise indicated, provide with the following features/accessories:

a. Top cap.
b. Anchor bolts with leveling nuts or leveling shims.
c. Provision for pole-mounted weatherproof GFI receptacle where indicated.

2.04 ACCESSORIES

A. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.

B. Threaded Rods for Suspended Luminaires: Zinc-plated steel, minimum 1/4" size, field-painted as directed.

C. Provide accessory plaster frames for luminaires recessed in plaster ceilings.

PART 3 EXECUTION

3.01 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.

3.02 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.

3.03 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 0533.16 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 0529.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Recessed Luminaires:
1. Install trims tight to mounting surface with no visible light leakage.

G. Suspended Luminaires:
1. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
2. Install canopies tight to mounting surface.

H. Pole-Mounted Luminaires:
1. Maintain the following minimum clearances:
   a. Comply with IEEE C2.
   b. Comply with utility company requirements.
2. Foundation-Mounted Poles:
   a. Provide cast-in-place concrete foundations for poles as indicated, in accordance with Section 03 3000.
      1) Install anchor bolts plumb per template furnished by pole manufacturer.

2) Position conduits to enter pole shaft.

b. Install foundations plumb.

c. Install poles plumb, using leveling nuts or shims as required to adjust to plumb.

d. Tighten anchor bolt nuts to manufacturer's recommended torque.

e. Install non-shrink grout between pole anchor base and concrete foundation, leaving small channel for condensation drainage.

3. Embedded Poles: Install poles plumb as indicated.

4. Grounding:

a. Bond luminaires, metal accessories, metal poles, and foundation reinforcement to branch circuit equipment grounding conductor.

5. Install separate service conductors, 12 AWG copper, from each luminaire down to handhole for connection to branch circuit conductors.

6. Install non-breakaway in-line fuse holders and fuses complying with Section 26 2813 in pole handhole or transformer base for each ungrounded conductor.

I. Install accessories furnished with each luminaire.

J. Bond products and metal accessories to branch circuit equipment grounding conductor.

K. Install lamps in each luminaire.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - 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.

E. Measure illumination levels at night with calibrated meters to verify compliance with performance requirements. Record test results in written report to be included with submittals.

3.05 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

3.06 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.

3.07 CLOSEOUT ACTIVITIES

A. See Section 01 7900 - Demonstration and Training, for additional requirements.

B. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.

3.08 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

3.09 ATTACHMENTS

A. Luminaire schedule.

END OF SECTION

SECTION 27 1000

STRUCTURED CABLING SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. The intent of this specification is to ensure a successful installation of an American National Standards Institute (“ANSI”) and Telecommunications Industry Association (“TIA”) Standards-Based Structured Cabling System (“SCS”) throughout the Project.

B. The SCS is to be constructed and tested to ANSI/TIA-568-C Standards for Category 6 and 6A performance. Certification requirements will include a minimum 25 year product and performance warranty.

C. The SCS provides the physical media for the Project’s Local Area Network (LAN) and, as such, provides connectivity for:

1. Data and telecommunication outlets.
2. Facility Monitoring System network devices, e.g., surveillance cameras.
3. Voice over Internet Protocol (VoIP).
4. Wireless Local Area Network (WLAN).
5. Building Automation System

D. The drawings and specifications and requirements between governing Codes and Regulations may vary. The more restrictive requirements shall be followed on this project.

E. Nothing in the Contract Documents grants authority or permission to disregard or violate any legal requirements.

F. Materials are to be purchased new for this project.

G. Materials that are listed by UL must bear the UL label. In the event UL has no published standard for a particular item, then other independent testing standards are to apply and the applicable labeling utilized.

H. Coordinate exact location and installation of equipment, power, grounding and raceway requirements with the Architect.

I. Provisioning is required for labor, equipment, materials, supplies and plant.

J. Related Sections:

1. The following list is intended only as a reference for the Contractor’s cognizance and may not represent a complete list of divisions of the Project Manual related to this section.
   a. Division 01: General Requirements.
   b. Division 08: Openings.
   c. Division 09: Finishes.
   d. Division 26: Electrical.
   e. Division 28: Electronic Safety and Security

K. The work of this section also includes:

1. Required licenses, insurance and permits including payment of charges and fees.

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2. Verification of dimensions and conditions at the job site.
3. Preparation of submittal information.
4. Installation of Owner Furnished Equipment (OFE) listed in Part 2 of this Section.
5. Installation in accordance with the contract document, manufacturer's recommendation, and in conformity with applicable codes and the authority having jurisdiction (AHJ).
6. Coordination of electrical service, including ground, for SCS/IT equipment locations.
7. Final tests and adjustments, written report, and documentation.
8. Instruction of system operation to Owner’s technical representative.
9. Provision of manuals.
10. Maintenance services and warranty.

1.03 REFERENCE CODES AND STANDARDS

A. Compliance with the following published codes, standards, and tests and recommended methods of trade, industry, or governmental organizations are required for Work in this section.

1. Telecommunications Industry Association (TIA)
    a. ANSI/TIA-568-C (series),Telecommunications Cabling Standards.
    b. ANSI/TIA-569-D, Commercial Building Standard for Telecommunications Pathways and Spaces
    c. ANSI/TIA-606-C, Administration Standard for Commercial Telecommunications Infrastructure
    d. ANSI/TIA-607-C, Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises
    e. ANSI/TIA-758-B, Customer-owned Outside Plant Telecommunications Infrastructure Standard
    f. TIA-526-7-A, Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant
    g. TIA-526-14-C Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant
    h. TIA/TSB-140 Additional Guidelines for Field-Testing Length, Loss and Polarity of Optical Fiber Cabling Systems
2. Other
    a. National Electrical Manufacturers Association (NEMA), VE 2-2018 Cable Tray Installation Guidelines
    b. BICSI Telecommunications Distribution Methods Manual (TDMM), 14th Edition
    c. BICSI Outside Plant Design Reference Manual, 5th Edition
    d. National Electric Code (NEC), 2017 Edition
    e. Underwriters Laboratory, Inc. (UL)
    f. Americans with Disabilities Act (ADA)
    g. Requirements of the local Authority Having Jurisdiction (AHJ).

1.04 DEFINITIONS

A. In addition to definitions of Division 01, the following list of terms used in this section are defined as follows.

1. “Furnish” indicates to purchase, procure, acquire, and deliver complete with related accessories.

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2. “Install” indicates 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.
3. “Provide” indicates to furnish and install.
4. Some processes, methods, and procedures, as well as spaces, rooms and structure, may be abbreviated or used interchangeably within this section. The following list is presented to reconcile these differences within this section.
    a. SCS: Structured Cabling System. A SCS is defined as all required cabling including hardware, termination blocks, cross connect wire or cordage, patch panels, patch cords, telecommunication outlets, work area cords, UTP and fiber optic cable installed and configured to provide computer data and voice connectivity from each data or voice device to the network file server or voice network/switch designated as the service point of the local area network.
    b. TS: Telecommunications Space. A common area used for telecommunications cabling terminations and the location of telecommunications equipment, typically a secure environmentally controlled area
    c. EF: Entrance Facility. A TS is the entrance to a building for both public and private network service cables, including the entrance point at the building wall or floor, and continuing to the entrance room or entrance space.
    d. MDF: Equipment Room. This is the TS that contains main electronics of the telecommunications system, such as servers, controllers and phone systems. This room is also often the center of the SCS that connects with all other TSs.
    e. IDF: Telecommunications Room. This is typically the TS where cables from workstations terminate. The IDF is designated for an exclusive purpose of housing telecommunication communications equipment and related wiring that serves a specific area of the building.
    f. TE: Telecommunication Enclosure. This is a stand-alone wall mounted or floor mounted enclosure that provides the same service as the IDF to a specific area of the building.
    g. WAO: Work Area Outlet. The workstation end-point of horizontal distribution cable. An icon legend is provided on the related drawings, and symbols or legends represent the type and quantity of cables terminated at the WAO.
    h. Backbone: The Backbone subsystem links the MDF to IDFs and TEs. It consists of the fiber optic or copper cables between these locations and the associated connecting hardware terminating this media.
    i. PBB: Primary Bonding Busbar – The common source for bonding telecommunications equipment within the MDF and the MDF with building ground.
    j. SBB: Secondary Bonding Busbar - The common source for bonding telecommunications equipment within the EF, IDF or TE and with the PBB.
    k. TBB: Telecommunications Bonding Backbone: Copper cable that connects the PBB to SBBs throughout the building.
    l. TBC: Telecommunications Bonding Conductor: Copper cable that connects the SBB to an electrical ground and building steel.

1.05 PROJECT CONDITIONS

A. Verify dimensions and conditions on the job site applicable to this work. Notify the 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

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shown, recommend solutions and/or submit drawings to the Architect for approval, showing how the work may be installed.

C. 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. When a conflict is reported after contract award, propose a resolution of the conflict and, upon approval, perform work.

D. During the course of construction, room names and/or room numbers may be changed. For continuity during installation the Contractor shall refer to rooms and spaces by their identities as shown on the technology series drawings. This shall apply to all correspondence, RFI's, proposal requests, and submittal packages pertaining to this Section.

E. Provide temporary or permanent protection of materials bearing the UL label that risk exposure to conditions that may compromise any portion of the material.

1.06 SCOPE SUMMARY

A. This entire specification section and the project drawings define the requirements for the installation of a SCS. The following is intended to summarize the Work and clarify design intent and is not an exhaustive description of the SCS.

B. Coordinate exact location and installation of the following:

1. Conduits, wire-ways, cable trays external to the telecommunication spaces, floor boxes, wall boxes, pull boxes, and junction boxes
2. Slots and sleeves
3. Firestopping products
4. AC power circuits for telecommunications equipment
5. AC power circuits within telecommunications spaces
6. Plywood wall linings within telecommunications spaces
7. Lighting requirements within telecommunications spaces
8. MEP systems and equipment terminating within or intersecting telecommunications spaces
9. Telecommunications grounding and bonding system required for telecommunications spaces
10. Wireless access points with light fixtures, HVAC ductwork, and architectural elements
11. Incoming service provider circuits

C. Deliver Submittals, Shop Drawings and Cable Test Records as specified herein.

D. Obtain permits, licenses, or other municipal requirements and pay any fees required for the execution of this Work.

E. Provide copper or fiber optic cabling for network communication applications homerun from the IDF to individual work area outlets or network devices as shown on the related drawings.

1. Provide faceplates, surface mount boxes, raceway products, copper and fiber optic inserts, blank inserts, patch panels, termination blocks, and copper and fiber optic patch cables.
2. Provide surge protection modules as specified and shown on drawings or required to protect circuits from damaging electrical surges.

F. Provide backbone cabling consisting of twisted pair copper, fiber optic cable, and ground wire as specified and shown on drawings.

1. Twisted pair cable terminations shall include both punch-down blocks and patch panels.
2. Fiber optic termination shall be with specified connector.

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3. Ground wire terminations shall utilize irreversible crimp style lugs.

G. Provide primary and branch pathway distribution systems which may consist of cable tray, conduit, J-hooks, of ladder runway for the support and protection of horizontal and backbone cabling.

H. Provide racks, cabinets, cable management, and cable runway to route cables and securely house telecommunications equipment and cabling termination panels.

I. Provide bonding of equipment racks, armored cable sheaths, and cable pathway system in accordance with equipment manufacturer's requirements and ANSI/TIA 607-C Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.

J. Provide labeling of the completed systems, components, and cabling in accordance with TIA-606-B or Owner's standards. Verify labeling scheme with Owner prior to implementation.

K. Provide mechanical and non-mechanical firestopping systems as specified or required by code.

L. Perform tests of the completed SCS installation in accordance with the following:

1. ANSI/TIA-568-C.2, for twisted pair cabling
2. ANSI/TIA-568.3-D, for fiber optic cabling

M. Supply accessories and minor equipment parts required for a complete working system, even if not specifically mentioned in these Specifications or on the drawings, without claim for additional payment.

N. Perform installation and testing utilizing trained and certified staff in order to provide the Owner's vendor of choice SCS extended product and application warranty certification. The Contractor shall extend this certification on behalf of the manufacturer.

O. Provide instructions to the Owner's designated personnel on the system documentation, proper methods of use and maintenance of the system and related components.

P. Provide the SCS complete and ready for use by the Owner.

1.07 CONTRACTOR QUALIFICATIONS

A. Must be a CommScope Uniprise Certified Integrator/Installer factory trained and authorized to provide the Owner's vendor of choice SCS extended warranty covering all network cable and connectivity hardware products comprising this project.

B. Must be a Tomball ISD approved SCS installer, no other installers will be considered:

1. E-Tech
2. Duke System
3. Triumph
4. TAG

C. Must submit current manufacturer certification documentation for installation training and ability to provide the manufacturer warranty.

D. SCS installation staff shall be employees of the certified vendor with a minimum of 25% of the installation staff to be factory trained and certified for the duration of the project.

E. Must have an on staff Registered Communications Distribution Designer (RCDD®) for the performance of quality control during installation, equipment set-up, and testing.

1. They are to be officed within 75 miles of the project site.

F. Must have five plus (5+) years of experience with equipment and systems of the specified types.

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G. Must have completed comparable sized projects. Provide a reference sheet of (10) similar size projects with project name and date of subnational completion with contact information confirming successful completion in the SCS system.

H. Must have proven abilities to test and certify telecommunications cabling systems, and to create test records in compliance with the referenced standards of this specification section and in accordance with the calibration requirements as stated by the test equipment manufacturer.

I. Must maintain a fully staffed and equipped service facility.

J. Must perform operations necessary to complete the installation of a SCS in accordance with these specifications utilizing related drawings.

K. At the request of the Architect, the Contractor must demonstrate an adequate staff with commensurate technical experience available.

L. At the request of the Architect, the Contractor must demonstrate adequate plant and equipment available to complete the work.

1.08 PRE-CONSTRUCTION SUBMITTALS

A. The pre-construction submittal is required to verify the Contractor will obtain the specified product, understands the processes and procedures, and understands the requirements to install, test, certify and create test record documentation for the SCS.

B. Requests for substitutions of specified product must be done using procedures specified in Division 01. Requests must be done prior to submittals. Substitutions submitted that have not been approved will be rejected.

C. The Submittal package is to be delivered for approval prior to commencement of Work.

1. Any submittals beyond the original submittal and one resubmittal may result in charges to the Contractor (charged for third and any subsequent reviews).
2. Additional review fees will be at the prevailing rate in effect at the time that the additional review takes place

D. The Submittal for this portion of the Work must be assembled and packaged as specified.

E. Provide submittals in an electronic version in Adobe PDF format as follows:

1. Document set shall be in a folder named as follows:
   a. “27 10 00 SUBMITTAL – PROJECT NAME – {*CONTRACTOR name*}”.
2. The submittals shall contain information in the following order
   a. “Project Compliance
   b. “Certificates”
   c. “Test Equipment”
   d. “Materials”
   e. “Labels & Markings”
   f. “Shop Drawings”

F. “Project Compliance” folder shall contain a PDF document that includes:

1. The first page stating the project title, submittal number, and submittal date in the header. This cover sheet must be imprinted with Contractor’s stamp, initialed or signed, certifying that the Submittal Package offered is in compliance with the requirements of this Section, and the material is in compliance with this Section of the Project Manual or with approved substitutions.
2. The next page shall state any questions or concerns that might be relevant to clarifying the work

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3. Provide a list of 'Approved' substitutions, if any.

G. "Certificates" folder shall contain a PDF document that includes:
   1. Current manufacturer Certification that shows that the Warranty requirement of this Section can be provided by the Contractor.
   2. RCDD certificate and any other BICSI certifications called out as a requirement in this Section

H. "Test Equipment" folder shall contain a PDF document that includes
   1. Provide a manufacturers technical data sheet of the test equipment that will be utilized for test and certification of the specified cabling. Include the Manufacturer, make and model.
   2. Submit an example of a test record document containing test records that have been created with the scheduled test equipment for the type of cabling to be tested.

I. "Materials" folder shall contain a PDF document that includes
   1. A complete materials list or Bill of Materials that includes all products specified in this Section or previously approved through the substitution request process in Division 1.
      a. Present the materials list or Bill of Materials in the order in which the product is specified in Part 2 of this section.
      b. The column headings for the list must include a product description, manufacturer, part number, quantity of item required, use or location on project, and PDF page number of product data sheet in this document.
   2. Product data sheets shall be combined into (1) PDF document. The PDF page number is the actual number of pages into the document where the product sheet can be found.
   3. Example

Description	Manufacturer	PN	Use	Page
Blue Category 6 jack	Ortronics	OR-TJ600-44	Data outlet	15

      a. Immediately following the list, insert the manufacturers' product data sheet (PDS).
      b. Arrange the sheets in the same sequence and order of the list of Materials.
      c. The literature must provide sufficient detail to facilitate proper evaluation of the product's suitability for use within the Work.
      d. Any PDS or literature sheets that provide product options, or sheets that also include items not intended for this work, must be clearly marked with an arrow or other appropriate symbol to indicate the model and/or option being submitted for the work.

J. "Labels & Markings" folder shall contain a PDF document that includes:
   1. Photos or drawings of the proposed labels, tags and markers for cables, patch panels, termination blocks, busbars, fire sleeves, enclosures, racks, outlet faceplates and other components as necessary.
   2. Representative nomenclature for equipment and cable labeling, with labeling as defined in ANSI/TIA-606-B Class 2 Administration Standard for the Telecommunications Infrastructure of Commercial Buildings. Include font sizes and styles, an explanation of the rationale for the nomenclature, and a Key, which defines the descriptors and designators of the labeling system.
   3. Labels shall be permanent and intended to last the life of the system, device, or equipment being labeled.
   4. Product sheets for label materials shall be included in the "Materials" folder

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K. “Shop Drawings” shall contain PDF documents including:
   1. Large-sheet drawings;
      a. Drawing rendered in AutoCAD™ or an AutoCAD™-compatible application.
      b. Execute drawings at an appropriate scale but no less than 1/8”=1’-0”.
      c. Create drawings using industry-standard graphics and a monochromatic scheme with varied line types and weight so the attributes of the various elements of the image are readily discernable.
      d. Enlarged floor plans and elevations of each equipment room in the project with equipment and ladder runway(s) placement in the rooms shall be shown to scale.
      e. The Shop Drawings will be the source document for the As-Built drawings that the Contractor is required to provide at the close of the project.
   2. Floor plan sheets that depict;
      a. Device symbol legend
      b. Individual service areas of the facility.
      c. Equipment room locations.
      d. Work area faceplate/outlets locations.
      e. Cable pathways, raceway type, and locations.
      f. Horizontal cable link length for longest cable lengths based on above routing.
      g. Location and size of wall penetrations/sleeve pass-thru.
      h. Quantity of cables passing through each wall penetration/sleeve pass-thru.

1.09 CONSTRUCTION CLOSE-OUT SUBMITTALS

A. Submit Closeout documentation in accordance with Division 01 of the Project Manual and any applicable supplements.

B. Each submittal shall be provided in a PDF format.

C. Provide each submittal PDF file with the project title and submittal number.
   1. Transfer media, CD, or memory stick shall be labeled with same information.

D. Segregate documents into separate folders containing data relevant to operational, maintenance, and warranty issues.

E. Warranty and Maintenance:
   1. Statement of warranty commencement date, length of warranty, and all warranty certificates issued by manufacturer.
   2. Provide a list of contact names, telephone numbers, and hours of operation for normal warranty service.
   3. Provide a contact name/number for 365/7/24 emergency warranty service with an explanation of limiting conditions if applicable.
   4. 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.
   5. Manufacturer data sheets and installation manuals/instructions for equipment installed shall be included.

F. Test Report CD(s)
   1. Results of copper and fiber-optic tests specified in Part 3 of this section of the Project Manual.

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a. The test records are to be a full test report of individual copper media and fiber optical media test results for each fiber-optic cable strand.

b. The test record must include information regarding the building, closet, patch panel and “port” number of the patch panel; the test device type and ID, the name of the test technician performing the test, and the date and time that the test was conducted.

2. The test records are to be placed in a “Test Record” file in ascending sequential order by building, closet and patch panel.

3. Provide an electronic file containing all individual test records and the software required to display and print the test records using a typical personal computer (PC).

G. As-Built Drawings

1. Provide “as-built” drawings of the completed cabling installation.

2. The as-built drawings must indicate:

a. The actual locations of the work area faceplate/outlets

b. Pathways and pathway fill

c. Media identification information at each faceplate/outlet

d. The identity information for each Equipment Room

e. Revised equipment rack layout detail drawings

f. All field changes, corrections, modifications, and updates to the shop drawings

3. One (1) color/laminated full-size drawing must be attached to the wall of each IDF to include the aforementioned information. Only the drop locations served from each particular IDF are to be included on each color/laminated drawing for that IDF.

4. Provide owner copies of “as-built” drawings on CD media in AutoCAD 2002 or later, Revit and PDF format.

H. Provide Owner any keys to cabinets and/or equipment and special maintenance tools required to repair, maintain, or service the system.

I. Furnish a list (in excel format) of all data drops listed by IDF number, patch panel number, and port number with the associated assigned room number.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Ship product in its original container, to prevent damage or entrance of foreign matter.

B. Handling and shipping in accordance with manufacturer’s recommendation.

C. Provide protective covering during construction, to prevent damage or entrance of foreign matter.

D. Provide warning placards, warning tape or protective barrier systems for temporary protection of products or personnel during installation processes to include but not limited to the following:

1. Cabling subject to foot or vehicle traffic laid on the floor/ground as a service loop.

2. Exothermic welding of telecommunications bonding conductors.

3. Open trench work during cabling installation.

E. Provide a minimum temperature schedule for cold climate installations of the SCS. Do not install cabling or equipment in climate conditions less than the manufacturer’s recommended minimum temperature.

F. Replace at no expense to Owner, product damaged during storage, handling or the course of construction.

1.11 PRODUCT WARRANTY AND APPLICATION ASSURANCE

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A. The SCS Manufacturer's Extended Product Warranty and Application Assurance requirements are as follows:
   1. Extended Product Warranty
   2. Application Assurance
   3. Term of Warranty
      a. A minimum of 25 years from the date of substantial completion.
      b. Moves, additions, or changes are covered by the original registration certificate if performed by an approved installer in compliance with the supplier's SCS design, installation and registration requirements.

B. Contractor's warranty covering installed products and labor against defects in materials and workmanship for a period of 1 year.
   1. Within the 1-year warranty period, answer service calls within 4 hours and begin work to correct the deficiency within twenty-four hours.

C. Manufacturer Warranty starts the date of projects warranty certification issue to the District from the manufacturer.

D. A manufacturer's Representative shall inspect and certify all work to validate the manufacturer's warranty.

PART 2 - PRODUCTS

2.01 GENERAL

A. Related Divisions and articles remain applicable to the products specified herein. Any repetition of related specification is for emphasis only.

B. Products shall be new, free from defects and listed by UL or ETL when an applicable standard exists.

C. Regardless of the length or completeness of the descriptive paragraph herein, provide product complying with the specified manufacturer's published specifications.

D. Product not specifically identified within this document, but which is required for the successful implementation of the intended system(s), shall be of the same class and quality as the specified product and equipment.

E. Products of one type must be from the same manufacturer throughout the entire project.

F. Products included in this Section are to establish performance requirements to be used on this project; equivalent products are acceptable with Owner approval.

G. Any materials required in the completion of the cabling infrastructure and make-ready for use by the Owner that is not listed is to be provided as if it were specified.

2.02 CABLE PATHWAYS AND SUPPORT

A. Conduit
   1. Refer to Division 26 for product details
   2. Requirements for bend radius, run lengths, and pull boxes are called out in this Section and on the drawings.

B. Cable Ladder Tray, 18"W x 4"H
      a. Aluminum I-beam design with 9" rung spacing with 7" rail height
      b. UL classified

C. Cable Ladder Tray Fittings

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1. Aluminum I-beam design with 9” rung spacing or solid bottom matching tray width and rail height
2. Provide for use at cable tray intersections, bends, and offsets
3. Adjustable splice plates are not acceptable for use in place of factory fittings
4. UL classified

D. Cable Ladder Tray Splice Plates
1. Provide UL classified splice plates for use with adjoining straight sections of cable ladder tray
2. Provide UL classified splice plates for use with adjoining straight sections of cable ladder tray to factory fittings
3. Provide with pre-drilled mounting holes
4. Provide with manufacturer recommended mounting hardware with the hex nut on the outboard side of the rail.
5. Provide expansion splice plates in accordance with NEMA VE-2, Table 3-2
6. Provide manufacturer recommended bonding jumpers on both side rails of adjoining sections of cable ladder tray at expansion joints

E. Cable Ladder Tray Strut Support
1. Provide strut support no less than 4” greater than the width of the cable tray
2. Provide with manufacturer’s recommended securing hardware in accordance with NEMA VE-2, Figure 3-6

F. Cable Ladder Tray Wall Support
1. Provide with manufacturer’s recommended securing hardware in accordance with NEMA VE-2, Figures 3-20 and 3-21
2. Provide for use with cable tray widths of 18” and less

G. Cable Ladder Tray Vertical Support
1. Provide with manufacturer recommended mounting hardware
2. Provide at minimum (2) support locations for vertical sections of tray greater than 12’

H. Basket Tray
1. 4” deep
2. UL listed
3. Approved products
    a. PEMSA Rejiband
        1) Zinc electro plated
            a) 12” Wide Part # 60213300-003
            b) 18” Wide Part # 60213450-003
            c) 24” Wide Part # 60213600-003
        2) Black
            a) 12” Wide Part # 60283300-003
            b) 18” Wide Part # 60283450 -003
            c) 24” Wide Part # 60283600-003
    b. Cablofil
        1) Electrozinc

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a) 12” Wide Part # CF105/300EZ
b) 18” Wide Part # CF105/450EZ
c) 24” Wide Part # CF105/600EZ

2) Black
a) 12” Wide Part # CF105/300BL
b) 18” Wide Part # CF105/450BL
c) 24” Wide Part # CF105/600BL

c. NVent Caddy
1) Electrozinc
a) 12” Wide Part # WBT4X12 S ZP
b) 18” Wide Part # WBT4X18 S ZP
c) 24” Wide Part # WBT4X24 S ZP

2) Black
a) 12” Wide Part # WBT4X12 S BL
b) 18” Wide Part # WBT4X18 S BL
c) 24” Wide Part # WBT4X24 S BL

d. Substitutions: Under provisions of Division 01.

I. J-hooks
1. Made for support of Category cables
2. Wide support
3. Available with multiple sizes for cable quantities
4. Available with variety of building attachment methods
5. Approved products
a. Erico CADDY CAT series
b. Panduit J-Mod series
c. CEAS 200 – 224 series
d. Cooper B-Line BCH series
e. Substitutions: Under provisions of Division 01

J. Standard firestop sleeve
1. UL classified
2. Rolled edges to eliminate bushings
3. Escutcheon plates and intumescent gaskets
4. Intumescent sealing putty
5. Approved products:
a. STI Firestop
1) 1” penetrations Part # FS100
2) 2” penetrations Part # FS200
3) 4” penetrations Part # FS400
b. Unique FireStop

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1) 1” penetrations Part # SF-1
2) 2” penetrations Part # SF-2
3) 4” penetrations Part # SF-4

c. Substitutions: Under provisions of Division 01

K. Conduit Waterfall
1. Designed for 4”
2. UL recognized
3. Control cable to minimum 4” radius
4. Approved products
a. Panduit CWF400
b. Substitutions: Under provisions of Division 0

L. Nonmechanical firestop systems
1. UL classified
2. Intumescent flexible block
3. Intumescent non-hardening putty
4. Intumescent pillows

2.03 COMMUNICATIONS EQUIPMENT ROOM FITTINGS

A. Plywood backboard
1. ¾” x 4’ x 8’ sheets
2. Void free A/C grade
3. Fire retardant
4. UL listed
5. All visible surfaces painted with 2 coats of light colored fire retardant paint, leaving (1) fire rating stamp visible on each sheet.

B. 2 post equipment rack:
1. 19” x 7’ with 3” channel
2. High strength aluminum
3. Black
4. 1000 lb. weight capacity
5. UL listed
6. RMU markings
7. Approved products:
a. CommScope Part # RK-45
8. Provide with (1) PDU
a. 120V Basic PDU
b. 13 NEMA 5-15/20R Outlets,
c. NEMA 5-20P Input
d. 1RU

C. 10” vertical cable manager:
1. Double sided, back gated

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2. For 7’ 45U racks
3. Front side dual opening door
4. Pass through opening
5. Black
6. Approved products:
    a. Commscope Part # VCM-DS-84-10B
    b. Verify with Owner IT prior to ordering

D. 12” ladder runway:
1. 10’ length (9’-11 ½”)
2. 3/8” x 1 ½” steel tubing
3. 12” cross member intervals
4. Available with mounting and cable routing accessories.
5. UL Classified
6. Black in color
7. Approved products:
    a. CommScope Part # CR-SLR-10L12W

E. Laddar runway, 3” channel mounting plate:
1. Black in color
2. Approved products:
    a. CommScope Part # 760084053

F. Laddar runway, radius drop:
1. Black in color
2. Approved products:
    a. CommScope Part # 760083956

G. Laddar runway, angled wall support:
1. Black in color
2. Approved products:
    a. CommScope Part # 760084160

H. Laddar runway, end caps:
1. Black in color
2. Approved products:
    a. CommScope Part # 760084012

I. Laddar runway, junction splice kit:
1. Approved products:
    a. CommScope Part # 760084046

J. Primary Bonding Busbar:
1. 4” x 12 x ¼” copper
2. UL listed
3. BICSI AND ANSI /TIA hole patterns
4. Comes with mounting brackets

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5. Approved products:
    a. Hoffman Part # DGTB412

K. Secondary Bonding Busbar
1. 2” x 12 x ¼” copper
2. UL listed
3. BICSI AND ANSI /TIA hole patterns
4. Comes with mounting brackets
5. Approved products:
    a. Hoffman Part # DGTB412

L. #6 CU ground wire:
1. Green THHN
2. UL listed

M. #6 grounding lug:
1. Provide irreversible crimp style
2. 2-hole, long barrel
3. ¼” hole size and 5/8” hole spacing
4. UL listed
5. Approved products:
    a. NSi Part # L6N-14

2.04 COMMUNICATIONS FIBER BACKBONE CABLING

A. Products combinations must allow for a long term manufacture warranty required by this Section.

B. 12 strand single mode armored fiber optic cable:
1. Riser rated
2. Approved products:
    a. CommScope Part # P-012-DZ-8W-FSUYL

C. Armored and shielded cable grounding clamp
1. Approved products
    a. CommScope 760258219

D. Single mode LC connector:
1. 900 micro boot
2. Fusion spliced
3. Approved products:
    a. CommScope Part # 760117895

E. Single mode LC adapter panels:
1. 12 fiber adapter panel
2. Aqua adapters
3. Approved products:
    a. CommScope Part # 760067165

F. Blank adapter panel:

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1. Approved products:
    a. CommScope Part # 760147751

G. Rack mount fiber enclosure:
1. Approved products:
    a. CommScope 2U Part # EPX-2U-PNL-ENC-FX
    b. CommScope 4U Part # EPX-4U-PNL-ENC-FX

H. Fiber optic patch cord:
1. LC-LC
2. Yellow
3. Single mode
4. Approved products:
    a. 3 meter CommScope Part # UDGLULU62
    b. Provide (4) patch cords for each fiber optic backbone cable installed. Confirm with owner prior to purchase.

2.05 TELECOMMUNICATION BONDING BACKBONE

A. #3/0 CU ground wire:
1. THHN
2. UL listed

B. #3/0 grounding lug:
1. Mechanical compression
2. 2 hole
3. Approved products:
    a. Burndy Part # YA272N
    b. Cooper B-Line Part # SBCL 3
    c. Substitutions: Under provisions of Division 01

2.06 COMMUNICATIONS HORIZONTAL UTP CABLING

A. Products combinations must allow for a long term manufactures warranty required by this Section

B. 4 pair Category 6 plenum rated UTP communications cable:
1. Blue jacket – Voice Data
2. Green jacket – IP cameras
3. Approved product
    a. CommScope Part # UN874043014/10

C. 4 pair Category 6A plenum UTP communications cable:
1. Yellow jacket
2. Approved product
    a. CommScope Part # CS44P-YEL

D. Category 6 RJ-45 jack, unshielded:
1. 8-position, 8-wire RJ45 receptacle
2. Match RJ-45 jack color with cable jacket color
3. Approved products:

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a. CommScope
1) Blue Part # 760237628
2) Green Part # 760237630

E. Category 6A RJ-45 jack, unshielded:
1. 8-position, 8-wire RJ45 receptacle
2. Yellow in color
3. Approved products:
a. CommScope Part # 760241143

F. Flush mount workstation faceplates:
1. Stainless steel
2. Use gray in color blank inserts for unused ports
3. 4 port outlet with label window
4. Approved products:
1) SEMTRON #1FM-(4)0E-AMP-LAB

G. Surface mount workstation:
1. With label window
2. Verify color with architect prior to purchase
3. Approved products:
a. CommScope
1) White 2 port Part # 107984056
2) White 4 port Part # 107952459

H. Category 6 patch panel:
1. Modular style panel
2. 24 ports per 1U rack space
3. Loaded with Category 6 RJ-45 jacks with colors to match cable jacket color.
a. Group by color
4. Blank inserts in unused ports, black in color.
5. Approved products:
a. CommScope
1) 24 port Part # CPP-SDDM-SL-1U-24
2) 48 port Part # CPP-SDDM-SL-1U-48

I. Category 6A patch panel:
1. Modular style panel
2. 24 ports per 1U rack space
3. Loaded with white Category 6A RJ-45 jacks to support installed cables
4. Blank inserts in unused ports, black in color.
5. Approved products
a. CommScope
1) 24 port Part # CPP-SDDM-SL-1U-24
2) 48 port Part # CPP-SDDM-SL-1U-48

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J. Category 6 patch cords, IDF:
   1. Approved products:
      a. CommScope, 6ft in length
         1) Blue jacket Part # UC1BBB2-0ZF006
         2) Green jacket Part # UC1BBB2-0MF006
   2. Provide the following quantities in colors matching the installed ports
      a. Provide blue in color for 120% (with 20% is attic stock) of the installed work area outlet/IP device ports, 6 foot
      b. Provide green in color for 120% (with 20% is attic stock) of the installed security camera outlet ports, 6 foot
   3. Confirm color, length and quantity with owner prior to purchasing

K. Category 6 patch cords, Workstation/Device outlet end:
   1. Approved products:
      a. CommScope, 10ft in length
         1) Blue jacket Part # UC1BBB2-0ZF010
         2) Green jacket Part # UC1BBB2-0MF010
   2. Provide the following quantities in colors matching the installed ports
      a. Provide blue in color for 120% (with 20% is attic stock) of the installed work area outlet/IP device ports, 6 foot
      b. Provide green in color for 120% (with 20% is attic stock) of the installed security camera outlet ports, 6 foot
   3. Confirm color, length and quantity with owner prior to purchasing

L. Category 6A patch cords, IDF:
   1. Approved products:
      a. CommScope, 6ft in length
         1) Yellow jacket Part # UC1AAA2 -09F006
   2. Provide 100% of the installed Access Point (AP) data outlet ports, 6 foot
   3. Confirm color, length and quantity with owner prior to purchasing

M. Category 6A patch cords, Device outlet end:
   1. Approved products:
      a. CommScope, 10ft in length
         1) Yellow jacket Part # UC1AAA2 -09F010
   2. Provide 100% of the installed Access Point (AP) data outlet ports, 10 foot
   3. Confirm color, length and quantity with owner prior to purchasing

2.07 COMPONENTS

A. Rack mount battery backup/UPSs are Owner furnished and installed.

B. Power Distribution is Owner furnished and installed

C. Wireless access points are Owner furnished and Contractor installed.

PART 3 - EXECUTION AND SCOPE

3.01 GENERAL

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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 TIA-568-C, TIA-569-D, and the BICSI Telecommunications Distribution Methods Manual (TDMM), including manufacturer recommended installation methods or practices for a standards-based SCS, are mandatory minimum standards and requirements.

C. Mount equipment plumb and level. Permanently installed equipment to be firmly and safely held in place. Equipment supports must support loads imposed with a safety factor of at least five.

D. Each outlet must consist of an outlet box and plate listed on the legend provided on drawings.

E. Coordinate with Architectural and Electrical drawings for locations of telecommunication outlets, junction boxes, conduits and floor boxes within the project.

F. Route cables from outlets to the nearest IDF unless the drawings designate cables to be routed to specific IDF locations. Notify the Owner's representative if any cables are expected to exceed a total of 295 feet termination to termination.

G. Provide temporary or permanent protection of materials bearing the UL label that risk exposure to conditions that may compromise any portion of the material.

1. Do not paint or allow paint overspray on products bearing a UL label unless specifically approved by the manufacturer.
    a. Cables exposed to paint or other chemicals are to be replaced.
    b. Cables will be replaced at no cost to the owner

3.02 CABLE PATHWAYS AND SUPPORT

A. Conduit

1. Install raceway and conduit system complete with offsets, pull boxes, junction boxes and fittings.
2. No raceway shall be run horizontally inside of walls or partitions. Exceptions: building perimeter walls under windows, clerestory panel walls, and where structural conditions do not allow vertical access to tops of walls.
3. Install rigid wall hot-dipped galvanized steel conduit in the following locations:
    a. Where exposed to physical damage
    b. Outdoors
    c. Indoors where exposed to moisture
    d. Where required by code
4. Install Electrical Metallic Tubing (EMT) – minimum size 1-inch in the following locations:
    a. Interior spaces not subject to moisture
    b. Where openly run communications cabling passes through inaccessible ceilings.
    c. As shown on drawings
5. PVC Conduit:
    a. Utilize PVC conduit for underground installations, minimum size 4-inch.
        1) PVC conduit runs shall have PVC coated rigid steel stub outs from the ground, including the last 90 degree bend.
        2) Elbows for conduit installed below grade shall be rigid steel conduit with two coats of corrosion-resistant paint or tape wrap.
6. Maintain proper conduit bend radius. For conduit with an internal diameter of 2" or less, maintain a bend radius of a least six (6) times the internal diameter. For conduit with an

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internal diameter greater than 2”, maintain a bend radius of at least ten (10) times the internal conduit diameter.

7. Multiple Conduit Installation:
   a. Install conduits parallel to or at 90 degrees to the structure. Multiple conduits shall not be installed using a single rod support. Multiple conduits running the same direction with spacing 48 inches apart or less shall be installed on the same trapeze.
   b. Trapeze hangers shall be supported on minimum 3/8-inch diameter all-thread rod attached to the structure with coupling nuts and expansion bolts or beam clamps.
   c. Conduit straps or other devices specifically designed for the purpose shall be used to secure conduits to the metal framing. Wire ties and hanger wires are not permitted.
   d. Conduits shall only be installed on the top surface of the metal framing, with multiple layered trapeze supports if required.
   e. Hanger rods shall not extend more than 1 inch past the lower trapeze metal framing. Use double nuts for all-thread rods.
8. Single Conduit Installation:
   a. Install single conduits parallel to or at 90 degrees to the structure and suspended from the structure on all-thread rods (1/4-inch minimum) or clamped and/or clipped to the structure with manufactured clamps/clips.
   b. When single conduits are suspended from all-thread rods, conduit clamps with bolts and nuts shall be used.
      1) Through partition wall penetration shall not be construed as a means of conduit support.
      2) Wire ties and hanger wires are not permitted.
   c. Single conduits may be secured as follows:
      1) Toggle bolts on hollow masonry.
      2) Bolts and expansion anchors in concrete or brick.
      3) Machine screws, threaded rods and clamps on steel.
      4) Conduit clips on steel joists.
      5) Plastic anchors are not allowed.
9. Install expansion fittings in metal conduit as follows:
   a. Conduit Crossing Building Expansion Joints:
      1) EMT all sizes.
      2) Rigid Galvanized Steel (RGS) all sizes.
   b. Conduits entering environmental rooms and other locations subject to thermal expansion and as required by NEC.
   c. Provide conduit expansion fitting with an integral bonding braid.
   d. Expansion fittings are not required where offsets, expansion loops, or flexible conduit are placed in conduit runs.
10. Install conduit concealed in walls, partitions and above ceilings.
11. Install exposed overhead conduit (at structure) of mechanical rooms and in other similar rooms where ceilings are not provided.
12. Avoid moisture traps where possible; where unavoidable, provide junction box with drain fitting at conduit low point.

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13. Use suitable conduit caps to protect installed conduit against entrance of dirt and moisture.
14. Install pull wires in empty conduits. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.
15. Cap ends of spare conduits and extend into space above accessible ceiling a minimum of 18 inches. Label conduit as spare.
16. Do not daisy chain conduit installations in or on walls, provide a single conduit wall drop per device.
17. Communications pathways exposed to public view shall be in conduit, stubbed to primary pathway/accessible ceiling
18. Exterior junction boxes, conduit/raceway, terminations, etc. at and those within enclosures where enclosures are exposed to outdoor conditions are to meet NEMA ratings for outdoor electrical applications.
19. Pull and junction boxes
    a. Pull and junction boxes shall be provided for conduit runs in excess of 100 feet.
    b. Provide boxes as shown on Drawings, and as required for wire pulling, equipment connection, and code compliance. Box locations shown on Drawings are approximate unless dimensioned. Verify location of outlets prior to rough in. Locate and install boxes to allow access and clearances per NEC.
    c. Locate pull boxes and junction boxes above accessible ceilings or in unfinished areas.
    d. Support pull and junction boxes independent of conduit.
    e. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations. Set floor boxes level and adjust floor box flush with finish flooring material.
    f. Support pull and junction boxes independent of conduit.
    g. Provide knockout plugs for unused openings.
    h. Switch boxes shall not be used as junction boxes
20. Conduits originating from cable tray require a manufacturer recommended conduit-to-tray mounting bracket.

B. Workstation outlets
1. Install backboxes with reducer rings as called out on the drawings
2. Each outlet must have a dedicated conduit extending 18 inches into an accessible ceiling, to cable tray or into a IDF.
    a. Daisy chaining of outlets is not allowed unless otherwise noted o the drawings.
    b. Conduits must be equipped with bushings and a 200lb test pull line.
3. Coordinate with Architectural and Electrical drawings for locations of telecommunication outlets, junction boxes, conduits and floor boxes within the project.
4. Do not install boxes back-to-back in walls. Provide minimum 6-inch separation in non-fire-rated walls. Provide minimum 24-inch horizontal separation in acoustic-rated walls.
5. Install boxes in walls without damaging wall insulation.

C. Surface metal raceways

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1. Raceway systems shall be installed complete, including insulating bushings and inserts where required by specified standards and/or required by manufacturer's guidelines. Unused raceway openings shall be closed.
2. Install raceways above ceilings, exposed, on walls and casework parallel to or at right angles to structure and casework. Securely support raceway at intervals not exceeding 10 feet or in accordance with manufacturer's recommendations.
3. The number of conductors installed in any raceway shall not be greater than the number for which the raceway is approved.

D. J-Hooks
1. Support cabling not installed in conduit or cable tray with J-hooks sized for the quantity of cable installed plus 20%.
2. Maximum of 48 cables per bundle.
3. Each cable type, by color, shall be bundled and supported in sperate j-hooks
4. Wherever practical install all cable running square with building structure.
5. Route cable bundles down hallways or other accessible routes.
6. Maintain an 8 inch minimum clearance between the bottom of the cable and accessible ceiling
7. Space J-hooks at no greater than 5 foot intervals unless a lesser interval will be required for product warranty.
8. J-hooks sized 1 5/16" and larger will have a cable retainer strap to contain cables on hanger. Straps must be suitable for use in air handling spaces, both removable and unusable.
9. Provide J-hooks with the proper configuration to attach to the building structure at each location.
    a. Where direct attachment to the building is not practical use of hanger wire or threaded rod attached to the building and dedicated to cable support is acceptable
    b. Do not attach J-hooks to any support used by other trades.

E. Fire wall penetrations
1. All penetrations through a fire rated wall or floor shall be sleeve with a metallic sleeve.
2. Seal the interior of the conduit sleeve around the cables and around the outside of the sleeve on each side of the penetration with fire-stop caulk or putty.
3. Attach the manufactures UL label on the wall adjacent to the penetration

3.03 COMMUNICATIONS EQUIPMENT ROOM FITTINGS

A. Provide rated fire retardant, painted plywood on walls of telecommunications rooms as shown on the drawings and secured flush with wall framework.
1. Install with fire rating stamp visible on each sheet of plywood.
2. Fire retardant paint shall be light in color to enhance lighting.
3. Install sheets side by side 6" off the floor with the 8' length vertical unless otherwise noted on the drawings.
4. Provide two overlapping layers of the specified plywood when covering masonry walls.
5. Plywood shall be permanently fastened to the wall by means of wall anchors utilizing galvanized, zinc plated, or stainless steel hardware with a flat head.
    a. Finished installation shall have a flush appearance with countersunk screw heads to prevent splitting of the plywood.
    b. Drywall screws are not acceptable.

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6. Plywood and paint shall be coordinated with the AHJ to meet applicable codes.

B. Provide floor standing network cabinets and racks with vertical cable managers at locations shown on the drawings.
   1. Install racks so that a minimum 3 foot clearance is maintained to the front, rear and at least one side.
      a. Clearance is measured from the wall or from the surface of permanently installed wall mount equipment to the leading vertical surface of the rack, cable manager or installed equipment.
      b. Notify owner/architect if any clearances will be less than 3 feet.
   2. The equipment rack(s) must be anchored to the floor. Utilize (4) ½" bolts and associated hardware (anchors & washers) for rack anchoring.
   3. Provide any seismic bracing required by local codes for free-standing racks designed and sealed by a registered professional engineer licensed to practice in the state.
   4. The cabinets and racks must be bonded to the PBB or SBB.
   5. Coordinate the installation of power circuits and conduit to prevent obstruction of equipment mounting rails.
   6. Mounting screws not used shall be bagged and left with the rack upon completion of the installation.

C. Provide wall mounted cabinets and racks at locations shown on the drawings.
   1. Install on plywood backboard matching the footprint of the cabinet/rack or larger.
   2. Install with minimum 3 foot working clearance in front.
   3. Install so swing out cabinets/racks have full clearance to open.
   4. The cabinets and racks must be bonded to the PBB or SBB.

D. Provide horizontal cable managers for cabinets and racks.
   1. When flat patch panels are provided for termination of copper cables, provide 1RU and 2RU cable managers so there is a least 1RU of cable management above or below every 24 ports. 2U of cable management is required between 48 port patch panels. Angled patch panels do not require horizontal cable managers and are designed for patch cords to route directly into vertical cable managers.
   2. Provide additional horizontal cable managers as shown on the drawings.

E. Provide shelves and additional cabinet/rack accessories as called out on the drawings

F. Provide overhead ladder runway in the configuration as shown on the drawings.
   1. Provide wall angle brackets and attach the ends of the ladder runway to walls.
   2. Where possible, provide and attach the ladder runway to equipment cabinets with cabinet to runway mounting plates and elevation kits.
   3. Provide support for the ladder runway every 5 feet.
      a. Cable runway will be mounted at a height of 7'-6" or 6" above equipment cabinets/racks unless noted otherwise.
         1) Support runway above rack with elevation kit.
      b. Support runway with equipment cabinets
      c. Support runway with triangle wall brackets
      d. Support runway from above with (2) support brackets and 3/8" threaded rod attached to building structure.

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1) Attach threaded rod to building structure using concrete anchors, beam clamps, or other devices designed for building attachment. Connections must have a pull-out strength and be spaced to provide support for the ladder runway to meet the manufacturer's load rating for the ladder runway.
2) Provide plastic threaded rod covers to cover lower 2 feet of threaded rod.

4. Provide any seismic bracing required by local codes for cable tray/runway designed and sealed by a registered professional engineer licensed to practice in the state.
5. Field cuts must be filed smooth, dressed square, and painted to match.
6. Provide end caps on exposed ladder runway ends.
7. Provide and connect ladder runway with appropriate butt splice kits, junction splice kits and other hardware designed for assembly of the runway system.
8. Provide cable radius drop out from ladder runway to vertical cable managers at every location where cables transition from the runway to the cable managers.
9. Use moveable cross members where required to mount the cable radius drop out so cables can be routed directly into the vertical cable managers.

G. Provide vertical ladder runway as shown on the drawings.
1. Attach to wall using vertical wall brackets or unistrut with J bolts.
2. Use cable runway foot kit to support vertical runway and secure it to the floor.
a. Bolt foot kit to floor with minimum 1/4" concrete anchors, bolts, and washers.
3. Provide end caps for top end of vertical runway.

H. Provide re-enterable firestop sleeves in wall(s) as shown on the drawings

I. Provide a PBB and SBB sized as described in Part 2 and shown on the drawings.
1. Bond PBB to main electrical service ground with #3/0 CU insulated cable.
a. Terminate with two-hole #3/0 ground lug.
2. Connect busbar to building structural steel with #6 CU ground wire.
a. Terminate with two-hole #6 ground lug.
3. Use correctly sized compress tools.

J. Provide connection from equipment racks and ladder runway within the telecommunications room, and cable tray and conduit that enter the room to the PBB or SBB.
1. Provide a home run #6 CU ground wire from each equipment rack unless drawings provide alternative grounding scheme.
2. Provide a home run #6 CU ground wire from each independent group of ladder runway sections.
3. Provide #6 CU ground strap between ladder sections to create a single ground plane.
4. Provide a home run #6 CU ground wire from any cable tray or conduit that enters the room.
5. Terminate ground wire with a two-hole #6 ground lug.
6. Use correctly sized compress tools

K. Remove any finish and make-bare any metallic surface at the point where grounding wire is connected to and or terminated on equipment frames, racks or devices. Use antioxidant joint compound for connecting unlike metals.

L. Coordinate and verify final connection of related electrical power.

3.04 CABLE - GENERAL PRACTICES

A. Confirm conduits have bushings prior to installation.

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B. Confirm firewall penetrations have sleeves or openings that will allow for the fire rating to be restored after cable installation.

C. Confirm penetrations through acoustically rated walls have sleeves or openings that will allow for the acoustic rating to be restored after cable installation.

D. Confirm pathways have adequate capacity to support the cable type and quantity.

E. Cover edges of cable/wire pass-through holes in chassis, housings, boxes, and raceways with insulated grommets

F. Only install cable in areas it was rated for

1. Do not install outside plant cables (OSP) more than 50 feet inside buildings unless inside of continuous metallic conduit.
2. Do not install riser rated cables (CMR. OFNR, OFCR) in plenum air spaces.
3. Do not install plenum rated cables (CMP, OFNP, OFCP) or riser rated cables (CMR. OFNR, OFCR) in outside plant environments, including conduits below/in slab that maybe exposed to moisture, unless they have a dual rating for outside plant.

G. Do not install cable in climate condition less than the manufacturer's recommended minimum temperature.

H. Install the cable so that the tension applied to the cables does not exceed the manufacturer's recommendation for the type and size of cable.

I. The cable shall not be crushed, deformed, skinned, crimped, twisted, or formed into tight radius bends that could compromise the integrity of the cabling.

J. Communication cables must not be run loose or lay upon ceiling grid or ceiling tiles.

K. Communications cable shall not be fastened to or supported by electrical conduits, mechanical ductwork/piping, sprinkler pipes, or routed to obstruct access to doors, utility access panels, or service work areas.

L. Maintain a 6 inch minimum clearance above accessible ceiling tiles.

M. Isolate cables and wires of different signals or different levels; and separate, organize, and route to restrict channel crosstalk or feedback oscillation.

N. Label cables within 12 inches of termination with the specified labeling scheme.

O. Dress cables neatly where exposed in the telecommunication room, securing cable bundles with plenum rated hook and loop tie wraps.

P. Cabling is to remain clean of all paint, or any other construction overspray / material. Contractor to take precautions necessary to ensure this requirement.

1. Damaged or contaminated cables shall be replaced at no cost to the owner.

Q. Outside plant copper cables that are exposed to potential damaging electrical surges must be terminated on Building Entrance Terminals (BET).

3.05 COMMUNICATIONS FIBER OPTIC BACKBONE CABLE

A. Provide fiber optic cables between telecommunications rooms as shown on the drawings.

1. Use a pulling grip or factory installed pulling eye for proper distribution of pulling forces.
   a. When pulling in conduit use a ball bearing swivel between the pulling grip and pull line.
   b. When pulling in conduit use a pulling lubricant designed for fiber optic cables.
2. Minimum bend radius during pull is 20 times the diameter of the cable, 10 times the diameter after the pull.

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3. Provide a minimum of a 10 foot service loop at each telecommunication room termination. Stage service loop in a figure eight conditions at the top of deck in the IDF, MDF or in the cable runway.
4. Armored fiber optic cable must have the armor grounded.

B. Provide fiber optic connectors on both ends of each fiber.
1. Maintain a clean environment for terminating fiber optic cables.
2. Clean and visually inspect the fiber before terminations.
a. Use a magnifying scope to look for contaminants.
b. Reclean if necessary
3. Follow manufacturer's instructions for correct connection procedure.
4. Visually inspect the connector after termination.
5. Cap the end of the connector until ready for connection to the adapter panel.

C. Provide fiber optic enclosures as called out on the drawings.
1. Mount in rack locations or on walls shown on the drawings.
2. Fiber optic enclosures should be sized for the number of adapter panels required to support the fiber cables plus blanks as described the next section.

D. Provide fiber optic adapter panels required for connection to each installed fiber.
1. Each adapter panels shall have fibers from only (1) cable connected to them.
2. When multiple panels are required for termination of a single cable, these panels shall be adjacent to each other.
3. When multiple fiber types connect each telecommunications room, group panels by fiber type.
4. Provide (1) blank adapter panel between each grouping of adapter panels.
5. Keep port covers on adapter panel ports until backbone fibers or fiber patch cords are attached.

E. 100% of fibers shall be tested in accordance with testing requirements in this Section.

3.06 TELECOMMUNICATION GROUNDING AND BONDING

A. Provide telecommunications bus bar of adequate size to provide bonding to equipment within telecommunications spaces.

B. Provide two-hole grounding lugs to connect the telecommunication bonding backbone to the telecommunications bus bars.
1. Connect busbar with bonding conductor to acceptable building steel and to main electrical service panel near the telecommunications space, complying with TIA standards referenced in this section.
2. Connection to the telecommunications bus bars shall utilize irreversible compression type connections.

3.07 TELECOMMUNICATION BONDING BACKBONE (TBB)

A. A. Provide a telecommunications bonding backbone conduit between telecommunications rooms as shown on the drawings.
1. The TBB should be installed without splices.
a. Taps are acceptable where pathways would otherwise be duplicated.
1) Taps shall be located within a telecommunications room.
2) Joined segments shall be connected using exothermic welding, irreversible

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3) compression-type connectors, or equivalent.
4) Joints shall be adequately supported and protected from damage.

B. Provide telecommunications bus bar of adequate size to provide bonding to equipment within telecommunications spaces.

C. Provide two-hole grounding lugs to connect the telecommunication bonding backbone to the telecommunications bus bars.
1. Connection to the backbone cable shall utilize exothermic welding or irreversible compression type connections.
2. Connection to the telecommunications bus bars shall utilize irreversible compression type connections.

3.08 COMMUNICATIONS HORIZONTAL UTP CABLING

A. Provide specified Category UTP cables homerun from workstation outlets shown on the drawings to the nearest telecommunications room unless otherwise noted.
1. Install in compliance with manufacturers installation procedures.
2. Do not install cables with a total length greater than 295 feet without written permission from the Owner's representative.
3. Install cable so that the pulling tension applied to the cable does not exceed 25 lbf or the manufacturer's guidelines whichever is lesser.
4. Install cable so that a radius bend of no less than six times the cables outside diameter is maintained during and after installation.
5. Maintain the following distances from sources of electrical interference
a. 6 inches from fluorescent lighting
b. 6 inches from grounded conduit cable used for electrical power distribution
c. 12 inches from unshielded electrical power cables
d. 48 inches from electric motors and transformers
6. Support and coil a 10 foot service loop at each workstation above accessible ceiling.

B. Provide Category rated RJ-45 jacks for various application in the colors called out in this specification and on the drawings.
1. Terminate cables on jacks with a T568B pinout for new building construction.
a. Match existing pinout for facilities undergoing remodel or expansion.
b. Strip cable jackets and untwist pairs only as much as is required to terminate individual pairs.
c. Match cable colors to jack colors called out for specific applications.
d. Install jacks at workstations in configurations shown on the drawings

C. Provide workstation outlet types in locations shown on the drawings

D. Provide Category rated patch panels to support workstation cables.
1. Terminate cables on patch panels grouped by applications if shown on the drawings.
a. Match existing pinout for facilities undergoing remodel or expansion.
b. Strip cable jackets and untwist pairs only as much as is required to terminate individual pairs, following manufacturers installation procedure.
2. Terminate cables on patch panels matching the 568A or 568B pinout used for the jacks.
3. Arrange patch panels on racks and in cabinets as shown on the drawings.

E. Provide horizontal cable managers for patch cord management

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1. Install 1RU and 2RU cable managers as shown on the drawings.

F. Furnish Category rated patch cords in colors, lengths, and quantities as specified or shown on the drawings.
   1. Confirm with owner prior to purchasing.

3.09 LABELING

A. Provide labeling in accordance with ANSI/TIA 606-B Level 1 numbering and ID format.

B. Mechanically print and install in accordance with drawing details.

C. Labels must be single line all capital letters bold font. Select font size of no less than 1/8" in height on the applicable device or cable.

D. Ensure all surfaces are clean prior to placing labeling products. Follow manufacturer's recommendation for cleaning.

E. Both ends of telecommunications cables, outlet faceplates, terminal blocks, floor boxes, termination cabinets, patch panels, bonding busbars, ground cables, equipment racks, and equipment rooms must be labeled in accordance with the aforementioned standards.
   1. At locations where outlets are out of sight above ceilings, provide an additional label with ½" lettering below the outlet on the ceiling grid or ceiling access panel.

F. Labels for cabling shall be self-laminating.

G. Hand written labels are unacceptable.

H. Locate the cable designator at the origination and destination of each cable within 12 inches of the point of termination or connection.

I. Provide machine printed wall plate labels meeting ANSI/TIA 606-B standards inserted behind built-in clear plastic windows.

3.10 TEST AND CERTIFICATION

A. Pretest notification
   1. Prior to conducting any field-testing of the SCS the Contractor must deliver to the project Architect a written notification of the test commencement date and the sequence of testing.
   2. If the Contractor elects to commence testing in a phased approach, prior to completion of cable installation, a test sequence schedule must be provided.
   3. Notification must be delivered to the Architect at least three weeks prior to the scheduled test date.
   4. Upon receipt of the notification the Architect will arrange for the Owner's technical representative to attend the commencement of testing.
   5. The purpose of the Owner's technical representative's attendance will be to observe:
      a. The type of test equipment being utilized compared to the scheduled test equipment.
      b. The test equipment can perform the tests to comply with the specified Standards.
      c. The Contractor's technical personnel are prepared to conduct the tests.
      d. The Owner's technical representative will make an Observation Report to the Architect
   6. Failure to offer notification as specified above will subject the Contractor to re-test any cabling that was tested prior to the OWNER's technical representative review, at no additional cost to the project.

B. Testing equipment and devices

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1. Test equipment must be capable of measuring the performance of the installed SCS and comparing the performance to the parameters specified in the applicable ANSI/TIA Standards.
2. Test equipment calibration must be current as defined by the test equipment manufacturer and included on individual test reports. Failure to perform SCS testing with equipment that meets this requirement will require retesting of applicable cabling at no additional cost to the Owner.
3. The following equipment list is provided to define the expected test equipment type. The test equipment is to be available for the entire test period through final inspection.
    a. Manufacturer – Fluke DSX series
        1) The most current software, firmware and appropriate launch cords must be used.

C. Horizontal twisted pair testing
1. The horizontal distribution cable must be tested to perform in accordance with ANSI/TIA-568-C. Cables must meet or exceed the requirements for horizontal, twisted pair cabling as specified in ANSI/TIA 568-C for a “PERMANENT LINK” test.
    a. Include this testing for Category 5e and above cables used for backbone or interconnect cables with distances less than 295 feet.
2. Any cable, which fails any given test, must be corrected or replaced. Such activity must be performed at no additional cost to the Owner.
    a. Only cables with PASS results will be accepted. Results that show PASS* will be considered a failed test.
    b. PASS* tests will be accepted if written approval is provided from the manufacturer providing the extended performance warranty on the system stating that these cable segments will be covered by the extended warranty.
3. Following manufacturer guidelines to test/certify long distance UTP cable.
    a. 2.5Gbps and 100W PoE up to 656 feet (200m).

D. Fiber cable testing
1. Perform bi-directional field testing of each terminated strand of fiber optic cable listed in this Section for length, loss and polarity. Field testing equipment must include both an optical loss test set (OLTS) and optical time domain reflectometer (OTDR). Testing measurements are required to meet transmission performances listed in ANSI/TIA-568.3-D/4.2/Table 1 at both 850 nm and 1300 nm for multimode fiber, and both 1310 nm and 1550 nm for single-mode fiber.
2. Submit cable certification reports of the following field testing measurement methods:
    a. Attenuation
    b. Length
    c. Polarity
    d. OTDR traces
3. Cable certification reports must bear the location/room number and cable identifier for each cable tested. Test results/reports in electronic copies by closet must be delivered to the Project Manager according to the submittal procedures.
4. Deliver an electronic file containing all individual test records and the software required to display and print the test records using a typical personal computer (PC).
    a. Deliver test results in a PDF format on a compact disk or DVD.

3.11 FINAL INSPECTION

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A. Be cognizant of the project schedule and execute work to comply with the Project Schedule for Final Inspection.

B. Ensure that the project management and the Architect are made aware of any issues that may prevent the completion of work prior to the scheduled final inspection time-frame.

C. Prior to the scheduled final inspection time-frame the following must be completed:

1. Complete installation, initial adjustments, tests and measurements
2. Submit Test Results and As-Built documentation to the Architect.
3. Notification of the Architect, in writing of the date that they will be ready for final inspection and test.
4. Submit warranty paperwork to the Owner's vendor of choice for the completed SCS.

D. No earlier than two weeks after receipt of the Contractor's notification the Architect's representative will schedule a final inspection.

E. During the Final Inspection site-walk make available:

1. A minimum of two people for inspection who are familiar with all aspects of the System.
2. Ladders and scaffolding necessary to inspect cable in cable trays and ceiling mounted junction boxes.
3. Test equipment specified and used for testing the SCS.

F. In the event the need for further adjustment or work becomes evident during the inspection, the Contractor is to continue working 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 specifications, and if 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. If the Contract Documents, law, ordinances, rules, regulations or orders of any public authority having jurisdiction require any Work to be inspected, tested or approved, the Contractor must give timely notice to the Owner and the Consultant of the readiness and the date arranged so they may observe such inspection, testing or approval procedure. In addition, the Owner or Consultant may require special inspection, testing or approval of material or Work for compliance with the requirements of the Contract Documents. Upon direction by the Owner and the Consultant, the Contractor must promptly arrange for such special testing, inspection or approval procedure. Should the material or Work fail to comply with the requirements of the Contract Documents, the Contractor must bear all costs to replace, fix, and/or re-terminate the failed work.

3.12 INSTRUCTION OF OWNER PERSONNEL

A. After final completion, instruct the Owner's designated personnel on the use, operation, maintenance, and care of the Systems.

END OF SECTION 27 1000

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SECTION 27 4116

INTEGRATED AUDIO/VIDEO SYSTEMS AND EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

A. Integrated Audio-Video Systems and Equipment as part of the Work.

1.02 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.

1.03 SECTION INCLUDES

A. Project instructions for the Contractor and System description details

B. System product description

C. Project completion instructions for the Contractor

1.04 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

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11. Instruction of operating personnel
12. Provision of manuals
13. Maintenance services and warranty.

1.05 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

1.06 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.

1.07 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. Cafetorium
   1. AV Presentation System
      a. A single projection screen presentation system shall be provided. The system will utilize a projection screen mounted to the proscenium wall. The screen will be motorized so that it can be raised out of sight when not in use. The screen should be a 16:9 aspect ratio for high-definition programming.
      b. The main projector shall be approximately 13,000 ANSI lumens, bright enough to illuminate the screen without dimming house lighting completely. The main projector shall have a minimum native resolution of 1920 x 1080.
      c. An AV-over-IP network shall distribute the video sources to the projector. Sources listed below shall be encoded to the network and decoded at the projector.
   2. Audio Sources

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a. Provide an assortment of dynamic and condenser microphones.
b. Provide wired microphone inputs around.
c. Provide ceiling mounted microphones over the stage for choral performances.
d. Provide a wireless microphone system with remote mounted antennas including handheld and body-worn transmitters.
e. Provide a rack mounted multi-media player for music playback at the main portable and stage control positions.
f. Provide a rack mounted multi-media recorder for music recording at the main portable and stage control positions.
g. Provide wired and wireless media connectivity.
h. Provide cabling and equipment accessories.

3. Video Sources
   a. Provide a wireless presentation system, connected to school WiFi network
   b. Provide an HDMI input at Stage Management Rack
   c. Provide an HDMI input in the Stage Right Technical Facility Panel
4. Mixing System
   a. Provide a rack mounted digital mixing system in the main portable rack.
   b. Provide a rack mounted mixer at the stage control position for simple operation.
5. Processing and Amplification
   a. Provide a dedicated audio DSP for signal routing and processing.
   b. Provide DSP amplification for loudspeakers.
   c. Provide audio system control via networked control system.
6. Loudspeakers
   a. Provide ceiling mounted loudspeakers distributed throughout the cafeteria space.
   b. Provide loose loudspeakers for on-stage monitoring.
7. Equipment Housing
   a. Provide a portable equipment rack for the main control position.
   b. Provide permanent wall-mounted rack in a dedicated room to house amplifiers and processing equipment.
   c. Provide permanent wall-mounted racks on stage for the stage manager’s control position.
8. Hearing Assist
   a. Provide a wireless, single channel radio frequency hearing assist system.
   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
9. Life Safety
   a. Provide a contact closure from the life safety system.

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b. System to mute upon contact closure and remain muted during the alarm.
c. System to continue previous operation when alarm has ended.

C. Band/Orchestra
1. Audio Sources
a. Provide microphones for recording.
b. Provide a rack mounted multi-media player for music playback.
c. Provide a rack mounted multi-media recorder for music recording.
d. Provide wired and wireless media connectivity.
e. Provide a line input connection at the front of the room for Owner provided metronome.
f. 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 wall mounted speakers at the back of the room for metronome playback for percussion instruments.
5. 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.
6. 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.

D. Choir
1. Audio Sources
a. Provide microphones for recording.
b. Provide a rack mounted multi-media player for music playback.
c. Provide a rack mounted multi-media recorder for music recording.
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.

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5. 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.
6. 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. Gymnasium
1. Audio Sources
    a. Provide wired microphone connections at either end of the court.
    b. Provide wireless microphone system.
    c. Provide dynamic microphones.
    d. Provide wired and wireless media connectivity.
    e. Provide cabling and equipment accessories.
2. Processing and Amplification
    a. Provide a dedicated DSP to the space.
    b. Provide DSP amplification for room loudspeakers.
3. Loudspeakers
    a. Provide surface mounted loudspeakers distributed over the court for audio coverage of the court.
4. 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.
5. Control
    a. Provide a touch panel control system for system operation.
    b. Touch panel to be located behind a protective hinged door.
6. 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
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.

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c. System to continue previous operation when alarm has ended.

F. Meeting Rooms

1. AV Presentation System

a. Provide a wall mounted display

b. Provide an floorbox HDMI connection to the display

c. Operation of the display will be by handheld remote control.

1.08 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 each of 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) For each product submitted, indicate which item in the specification it is submitted for.

7) 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.

8) 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

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cent of the material. Maximum size: three-inch spine. Use multiple volumes as required. Separate major grouping with labeled binder tabs.

9) 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

3) 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.

4) Patch panel(s): Layouts and designation (labeling) strips, including color schemes.

5) Full fabrication details of any custom enclosures and millwork indicating size, material, finish and openings for equipment.

6) Structural rigging and mounting details:

a) 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:

(1) Analysis of all components in the load path and attachment method to building structure for suspended loudspeakers.

(2) Attachment method for mounting brackets at ceilings, walls, or other building features.

(3) Detail the product manufacturer, part numbers, and load capacity of the hardware fittings and materials selected for suspended or mounted loudspeakers.

(4) A copy of the design calculations.

(5) Secondary steel required for attachment to the building structure.

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(6) Custom brackets, mounts, suspension grids or trusses, loudspeaker cabinet frames, or loudspeaker brackets.

(7) Loudspeaker brackets or mounts provided by the specific loudspeaker manufacturer being installed that do not include traceability data.

7) Traceability data and/or ANSI standard compliance data for loudspeaker mounting brackets or rigging provided by the loudspeaker manufacturer.

8) Risk analysis data as referenced in Part 3.2, F

9) Stamping Engineer post-installation sign-off as described in Part 3.2, F

10) Proof of ETCP certification for on-site rigging crew.

11) Projector, loudspeaker, camera mounting details, include hardware types and load capacity.

12) Fabricated Plates and Panels

a) 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.

13) Labeling

a) Equipment and cabling labeling scheme. Include font sizes and styles, explanation of scheme, and designator schedule.

14) Schedules

a) 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.

15) Control System Software

a) Provide electronic copies of proposed control system user interfaces within sixty (60) days of issuance of Notice to Proceed (NTP).

16) IP Addresses

a) Coordinated with the venue IT Administrator, provide a list of IP addresses, by device, used in the project.

e. Consultant's project documents in electronic format will not be supplied to the Contractor for their use as part of submittals.

f. Detail drawings executed at an appropriate scale, but not smaller than 1/8 inch = 1'–0".

g. Submissions that do not follow the format and configuration described above will be returned without review.

h. 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.

1.09 CONTRACT CLOSE-OUT DOCUMENTS:

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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.

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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.

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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.

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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.

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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

2.01 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.

2.02 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.

2.03 MICROPHONES AND ACCESSORIES

A. Single Wireless Microphone System (WRLS, Type 1):

   a. 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 SLXD4D 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.

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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. Bodypack Wireless Microphone (Type 1)
1. Theatrical/presentation headset/lapel mic
2. Acceptable Product:
    a. Shure SLXD1 Bodypack Transmitter
        1) Shure SB903 Lithium Ion Battery
        2) Shure UL4#-MTQG Headset Microphone (coordinate color with Owner)
        3) Shure MX153#/O-TQG (coordinate color with Owner)

F. Bodypack Wireless Microphone (Type 2)
1. Athletic headset/lapel mic
2. Acceptable Product:
    a. Shure SLXD1 Bodypack Transmitter
        1) Shure SB903 Lithium Ion Battery
        2) Shure UL4#-MTQG Headset Microphone (coordinate color with Owner)
        3) Shure SM31FH

G. Handheld Wireless Microphone (Type 1)
1. Beta 87A capsule
2. Acceptable Product:
    a. Shure SLXD2/B87A Handheld Transmitter
        1) Shure SB903 Lithium Ion Battery

H. Wireless Microphone Charge Base (Type 1)
1. 2 Port Wireless Microphone Charging Dock
2. Acceptable Product
    a. Shure SBC10-903-US Battery Charger Base

I. Wireless Microphone Charge Base (Type 2)
1. 8 Port Wireless Microphone Charging Dock
2. Acceptable Product:
    a. Shure SBC80-903-US Battery Charger Base

J. Vocal Microphone: (Type 1)
1. Handheld dynamic cardioid pattern
2. Acceptable Product:
    a. Audix OM6
    b. Shure Beta58a
    c. Approved Equivalent

K. Instrument Microphone: (Type 1)
1. Dynamic cardioid pattern

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2. Acceptable Product:
    a. Audix D4
    b. Shure Beta57a
    c. Approved Equivalent

L. Instrument Microphone: (Type 2)
1. Condenser cardioid pickup pattern
2. Acceptable Product:
    a. Audix f9
    b. Shure SM81
    c. Approved Equivalent

M. Instrument Microphone: (Type 3)
1. Boundary style condenser
2. Acceptable Product:
    a. Audix ADX60
    b. Shure Beta91a
    c. Approved Equivalent

N. Choir Microphone: (Type 1)
1. Hanging condenser
2. HyperCardioid pattern
3. Acceptable Product:
    a. Audix ADX40HC
    b. Shure MX202B/S

O. Podium Microphone (Type 1)
1. Goose neck condenser microphone
2. Cardioid pattern
3. Acceptable Product:
    a. Shure MX412/C

P. General Purpose Microphone: (Type 1)
1. Handheld dynamic cardioid pattern
2. Acceptable Product:
    a. Shure SM58
    b. Approved Equivalent

Q. Suspended Microphone: (Type 1)
1. Phantom powered
2. Acceptable Product:
    a. Audix ADX40 with CPSADXC cardioid capsule
    b. Shure MX202B/C
    c. Approved Equivalent

R. Microphone Stands and Mounting Hardware:
1. Acceptable Product:

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a. TYPE 1: Round-base floor stands, Black
   1) Atlas MS-10CE w / PB11XEB
   2) Approved Equivalent
b. TYPE 2: Heavy Duty floor stand, Black
   1) Atlas SB11WE
   2) Approved Equivalent
c. TYPE 3: Boom Arm Short, Black
   1) Atlas PB11XEB
   2) Approved Equivalent
d. TYPE 4: Boom Arm Long, Black
   1) AtlasPB21XEB
   2) Approved Equivalent
e. TYPE 5: Tabletop stand, Black
   1) Atlas SMS2B
   2) Approved Equivalent

2.04 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.
   2. Digital input and output: S/PDIF, AES/EBU
   3. 1-U Rack Mountable.
   4. Bluetooth Receiver
   5. USB & Aux input
   6. RS-232 Control
   7. Wired remote control
   8. Acceptable Product:
      a. Tascam SS-R250N

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:

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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:
a. Whirlwind PC-USB
b. Radial USB-Pro
c. 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. Coordinate finish with Architect
6. Acceptable Product:
a. RDL D#-CIJ3D

H. Bluetooth Receiver (BTRX, BTIO, Type 1)
1. Input: Bluetooth

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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)

2.05 MIXERS

A. I/O Expander (MIX IO, Type 1)
    a. Portable digital audio expander.
    b. 16 balanced inputs
    c. 8 balanced outputs
    d. Acceptable Product:
        1) Allen & Heath AB168

B. Mixer (MIXER, Type 1):
    1. 6 input rack mount mixer
    2. 6 mono mic/line inputs
    3. 3 stereo line inputs
    4. Stereo line output
    5. 2 mono line outputs
    6. Acceptable Product:
        a. TOA M-633D

C. Mixer (MIXER, Type 2):
    1. 16 input digital rackmount mixer
    2. 8 outputs
    3. 48 channels
    4. 36 mix busses
    5. USB audio input/output.
    6. Rack Mountable.
    7. Acceptable Product:
        a. Allen & Heath SQ-5
            1) SKB 1SKB-RE-SQ5

D. Mixer (MIXER, Type 3)
    1. 2 mic/5 stereo line inputs.
    2. 3 stereo zone outputs
    3. Rack Mountable.
    4. Acceptable product:
        a. Tascam MZ-223

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2.06 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 24f

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

2.07 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.

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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. QSC CX-Q 2K4
b. LEA CONNECT 35xD
2. Type 2
a. LEA CONNECT 35x

2.08 LOUDSPEAKERS

A. General
1. Coordinate loudspeaker/grille and hardware colors with Architect
2. Provide all necessary mounting hardware, brackets, supports and any secondary steel required to attach loudspeaker to building structure.

B. Speaker (Type 1 – 9)
1. Not Specified

C. Speaker (Type 10)
1. Type: Compact surface mount two-way, full-range loudspeaker
2. Configuration: 12-inch woofer, 90° x 50° horn
3. Frequency Response: 62Hz – 19kHz
4. Power: 600W program @ 8Ω
5. Sensitivity: 95dB (1W/1m)
6. Acceptable Product:
a. JBL PRX412M
1) JBL PRX412M-CVR

D. Speaker (Type 11)
1. Type: Pendant loudspeaker
2. Configuration: 6.5-inch driver and a 1-inch dome tweeter
3. Frequency Response: 68 Hz – 17 kHz
4. Power: 150W @ 8 ohms
5. Taps: 60W / 30W / 15W / 7.5W @ 70V
6. Coverage: 120-degree conical
7. Acceptable Product:
a. JBL Control 67P/T
b. QSC AD-P6T

E. Speaker (Type 12 – 20)
1. Not Specified

F. Speaker (Type 21)
1. Type: Surface mounted loudspeaker
2. Configuration: 12-inch coaxial two-way loudspeaker

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3. Frequency Range: 55 Hz – 20 kHz
4. Power: 600W @ 8 ohms
5. Coverage: 90-degree conical
6. Acceptable Product:
    a. Tannoy VX12
        1) Tannoy VMB
        2) Tannoy VXY12
    b. Renkus-Heinz CX121M
        1) Renkus-Heinz UBKT/CT121M

G. Speaker (Type 22 – 30)
1. Not Specified

H. Speaker (Type 31)
1. Type: Surface mounted loudspeaker
2. Configuration: 8-inch two-way loudspeaker
3. Frequency Range: 37 Hz – 18 kHz
4. Taps: 110W / 55W / 28W / 14W @ 70V
5. Coverage: 110 x 85 degree
6. Acceptable Product:
    a. JBL Control 29AV-1
        1) JBL MTC-29UB

2.09 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. 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

C. 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.

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4. Select size of product based working load limits required.
5. Acceptable Product:
    a. Crosby Group G-400 Series

D. 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

E. 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

F. 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)

G. 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:

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a. Crosby Group G-411 Series

H. 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-5200-216 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 PROJECTION SCREENS

A. 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:

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a. Tab tensioned screen
b. Low Voltage Controller
c. Slot Closure
d. 16:9 aspect ratio
e. HD Progressive 1.1 Contrast screen material

4. Provide custom black drop as required to locate bottom of image as shown in elevation details
5. Screen Size: Reference projection screen schedule
6. Acceptable Product:
   a. Da-Lite Tensioned Advantage Custom

2.12 VIDEO PROJECTORS

A. Video Projector (PROJ, Type 1)
1. Laser WUXGA 3LCD Projector
2. Native Resolution WUXGA (1920 x 1200) with 4K Enhancement Technology
3. Brightness 13,000 lumens
4. Control Communication RS-232C
5. Field verify throw distance to determine appropriate lens
6. Provide required lens
7. Acceptable Product:
   a. Epson EB-PU2213B

2.13 AV SOURCES

A. Wi-Fi Presentation Gateway (WPS Type 1):
1. Allows simultaneous display of up to four presentation sources
2. Remote View: Up to 40 remote users can connect via a Web browser
3. Output Signal Types: HDMI, RGB
4. Output Resolution: 1920x1080@60Hz
5. Acceptable Product:
   a. Crestron Air Media AM-3200-WF
   b. Pre-approved equal

2.14 ENCODERS/DECODERS

A. AV over IP Encoder (ENC, Type 1)
1. 4K60 4:4:4 Video Support
2. One Gigabit LAN Port for 4K60 4:4:4 Video, Dante®/AES67, and Control
3. HDMI 2.0 and HDCP 2.2, 2.3 Compliant
4. Fits 2-gang back box
5. Coordinate color with Architect
6. POE
7. Acceptable Product:
   a. Visionary DuetE5-WP-H

B. AV Over IP Encoder (ENC, Type 2)

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1. 4K60 4:4:4 Video Support
2. One Gigabit LAN Port for 4K60 4:4:4 Video, Dante®/AES67, and Control
3. HDMI 2.0 and HDCP 2.2, 2.3 Compliant
4. Surface Mount Encoder
5. POE+
6. Acceptable Product:
    a. Visionary DuetE-5 Encoder

C. AV Over IP Decoder (DEC, Type 1)
1. 4K60 4:4:4 Video Support
2. One Gigabit LAN Port for 4K60 4:4:4 Video, Dante®/AES67, and Control
3. HDMI 2.0 and HDCP 2.2, 2.3 Compliant
4. Surface Mount Encoder
5. POE
6. Acceptable Product:
    a. Visionary D5100 Decoder

2.15 AV NETWORK HARDWARE

A. AV Network Switch (AV SWITCH, Type 1)
1. 1RU Rackmount
2. 10/100/1000 BASE-T RJ45 ports
3. 10000BASE-X SFP ports
4. Switching Fabric: 240 Gbps
5. Acceptable Product:
    a. Netgear M4250 Series

2.16 CONTROL SYSTEMS

A. Room Control Relay Unit (RMC, Type 1)
1. Native network low-voltage relay connectivity solution for Q-SYS
2. Four (4) dry contact closure relay circuits with Normally Open (NO), Common (C), and Normally Closed (NC) connections
3. Power-over-Ethernet (PoE) capable
4. Surface- or rack-mountable (1RU, quarter-width)
5. Includes surface mounting hardware
6. Acceptable product to include
    a. Q-SYS QIO-LVR4
    b. Q-SYS QIO-RMK rack mounting kit

2.17 USER INTERFACES

A. Touch Panel (TP, Type 1)
1. Projective capacitive (PCAP) multi-touch, Power over Ethernet, 24-bit color display.
2. Viewable Screen Dimensions (diagonal) 10 inch
3. Resolution 1920 x 1200
4. POE+ Class 5

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5. Acceptable Product:
    a. QSC TSC-101-G3

2.18 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.
    4. Coordinate wiring of high voltage components.
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. Network controlled power sequencer
    2. Rack mounted
    3. 8 controlled outlets
    4. 1 unswitched outlet
    5. 20A capacity
    6. Acceptable Product:
        a. Middle Atlantic RLNK-P920R
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. Acceptable Product to Include:
        a. Middle Atlantic MPR-xA

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b. Middle Atlantic RLM-20A (Switched Module, as needed)
c. Middle Atlantic RLM-30A (Switched Module, as needed)
d. 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. Remote power turn on.
4. Acceptable product:
a. Furman Sound PL-PRO C
b. Approved Equivalent

H. Power Protection with Lights (POWER/LIGHT):
1. For small or portable rack applications
2. 15 Amp power system.
3. Eight switched AC outlets.
4. Acceptable product:
a. Furman Sound PL-8C
b. Approved Equivalent

I. 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 Easy UPS Series

2.19 EQUIPMENT HOUSING AND ACCESSORIES

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A. General
    1. Refer to drawings for equipment rack sizes and additional notes.
B. Wall Mounted Equipment Rack (Type 1)
    1. Finish: Textured black powder coat
    2. Tapped 10-32 rack rails
    3. Acceptable Product:
        a. Middle Atlantic DWR series
            1) Middle Atlantic FAN2-DC-FC
            2) Middle Atlantic LVFD series
C. Floor-Supported Wall Rack (Type 1)
    1. Finish: Black powder coat
    2. Tapped 10-32 rack rails
    3. Acceptable Product:
        a. Middle Atlantic SR series
            1) Middle Atlantic LVFD series
            2) Middle Atlantic DWRSR-6-FK series
D. 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
E. Rack Blanks (BLANK)
    1. Flanged, aluminum panel.
    2. Anodized finish.
    3. Acceptable product:
        a. Middle Atlantic BL series
F. Rack Vents (VENT)
    1. Flanged, aluminum panel.
    2. Anodized finish.
    3. Acceptable product:
        a. Middle Atlantic VTP series
G. Cable Management
    1. Brush grommet panel
    2. Acceptable Product:
        a. Middle Atlantic BR series
H. Rack Drawers (DRAWER)
    1. Blank anodized finish
    2. Acceptable product:
        a. Middle Atlantic D series
I. Rack Mounted Sliding Shelf (SLIDE OUT SHELF)

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1. Finish: Black
2. 1-RU rack mountable sizes.
3. Acceptable product to include:
    a. Middle Atlantic SS

J. 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

2.20 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 Architect. 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. Acceptable Manufacturers:
    a. EMG
    b. RCI Custom
    c. ProCo
    d. Radial Engineering

2.21 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.

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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. 3.5mm Stereo Panel Mount Connectors
1. Provide panel mount 3.5mm connectors with unified metal shell.
2. RF-Protector connectors.
3. Shell Color: Black.
4. Terminations: Solder.
5. Acceptable Product:
    a. Switchcraft EH35MMMSCB

D. 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

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

2.22 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

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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. 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

C. 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.

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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

D. 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

2.23 INSTALLED 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.

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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. 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

D. 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

E. 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

F. Category Cable
1. 23-gauge solid cable
2. Category 6+ Enhanced
3. 4 pair, UTP
4. Acceptable Product
a. Belden 2412F

G. Wireless /Assisted Listening Antenna Cable

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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

H. 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

I. HDMI Cable Shorter Than 50’
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

J. HDMI Hybrid Fiber Optic Cable
1. Provide pre-molded cables in lengths as required
2. Acceptable Product:
    a. Extron HD Pro P/50 (26-726-50)
    b. Extron HD Pro P/75 (26-726-75)
    c. Extron HD Pro P/100 (26-726-100)
    d. Extron HD Pro P/125 (26-726-125)
    e. Extron HD Pro P/150 (26-726-150)

2.24 MISCELLANEOUS

A. Headphones (Type 1):
1. Acceptable Product:
    a. Sony MDR-7506
    b. Shure SRH440
    c. Approved Equivalent

B. Mobile Cabinet: (Type 1) – Microphones / Accessories
1. Lockable
2. Steel construction
3. 4 Drawers
4. Large 6” casters
5. Acceptable Product:
    a. Westward 3401NVS-5PU-95W

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b. Approved Equivalent

C. Mobile Cabinet: (Type 2) - Speakers / Cables
   1. Lockable
   2. Steel mesh construction
   3. Large 6” casters
   4. Double doors
   5. Acceptable Product:
      a. Grainger 9WMJ8
      b. Approved Equivalent

PART 3 - EXECUTION

3.01 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.

3.02 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.

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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.

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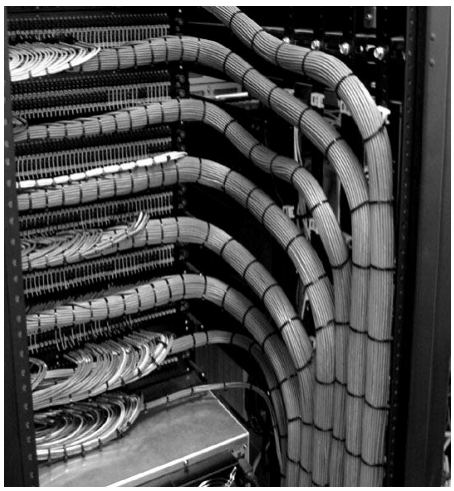

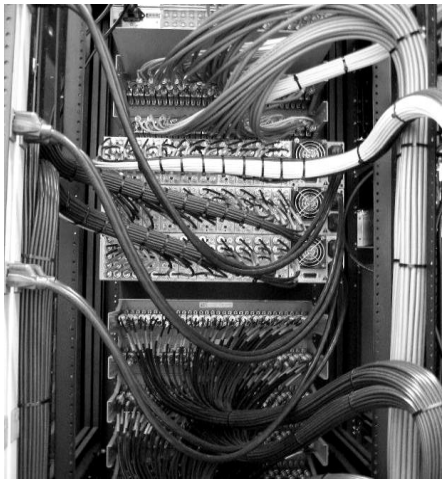

b. Provide adequate service loops so that equipment mounted on rack slides may be pulled fully out, to their locked position without straining cable.

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.

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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.

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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.

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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.

3.03 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.

3.04 CONTROL SYSTEM PROGRAMMING

A. General
   1. Audio level controls
      a. Audio level controls to use UP/DOWN buttons to change audio levels in 2 dB increments (or closest translation by control system).
      b. Microphone and line level controls to have a fixed range between 0 and -24 dB.
      c. Audio outputs/zone output level controls to have a fixed range between 0 and -6 dB.
      d. Provide visual feedback of current level setting.
      e. Provide additional level control upstream of user-level control to set the overall level for each zone.
   2. Audio System with power sequencing definitions:
      a. STANDBY: System is powered on with all outputs muted in processing.

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b. MODE: See individual systems for exact routing in each mode. System is on and outputs are unmuted in processing.

c. OFF: System is powered down with all outputs muted in processing.

B. Cafetorium

1. DSP functions triggered by AV Control System touch panel.

a. System modes/presets:

1) STANDBY: Audio DSP preset to mute all output capability of the system. AV Control System to un-route all video signals, power off all displays and projector(s), and retract projection screen(s.)

2) EVENT: This preset to change Audio DSP Source Matrix to route the outputs of the portable digital mixing system to the main loudspeakers. All outputs of the DSP to be unmuted.

3) PRESENTATION: This preset to change Source Matrix to route the outputs of the presentation system to the main loudspeakers as shown in functional diagrams.

a) Volume controls: Provide volume controls for sources shown in DSP diagram.

b) Mute controls: Provide mute buttons for sources shown in DSP diagram.

2. Low voltage controls for DSP

a. PAGE/FIREALARM: Triggered by the paging and/or fire alarm system, this trigger to display a lockout notification due to fire alarm/paging event. This notification should temporarily halt all controls from the touch panel until the trigger is released.

3. The Stage Managers Touch Panel and Control Position touch panel video controls shall mirror one another. Any button presses on either panel shall show on both panels

C. Gymnasium

1. DSP functions triggered by AV Control System touch panel.

a. Volume controls: Provide volume controls for sources shown in DSP diagram.

b. Mute controls: Provide mute buttons for sources shown in DSP diagram.

2. Low voltage controls for DSP

a. PAGE/FIREALARM: Triggered by the paging and/or fire alarm system, this trigger to display a lockout notification due to fire alarm/paging event. This notification should temporarily halt all controls from the touch panel until the trigger is released.

D. 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.

E. Screen/Shade Control

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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.

F. 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.

G. 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.

H. 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.

I. 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.

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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.

J. 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.

K. 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.

L. 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.

M. 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.

N. 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.

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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.

O. 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.

P. 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.

3.05 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.

3.06 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.

3.07 COMMISSIONING

A. Prior to energizing or testing the system, ensure the following:

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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

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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

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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.

3.08 CAT5E/CAT6 CABLE CERTIFICATION

A. General Field Test Requirements

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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

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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.

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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.

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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.

3.09 FINAL OBSERVATION & TESTING

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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.

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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. Cafetorium
    a. 4 hours of instruction
2. Music Rooms
    a. 2 hours of instruction
3. Gymnasium
    a. 2 hours of instruction

B. Video record all training sessions and compile a training video to be provided to the Owner on DVD.

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 4116

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SECTION 27 5000
DISTRIBUTED COMMUNICATIONS AND MONITORING SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. General provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section. Reference AV drawings for additional information.

B. The work of this section also includes:

1. Required licenses, insurance and permits including payment of charges and fees
2. Verification of dimensions and conditions at the job site
3. Preparation of submittal information
4. Pick-up of Owner Furnished Equipment (OFE) and incorporation into project if applicable.
5. Development and implementation of AV control system software code and control panel layouts, which will become the property of the Owner
6. Installation in accordance with the contract document, manufacturer's recommendation, and in conformity with applicable codes and authority having jurisdiction (AHJ)
7. Extension of electrical service, including ground, to equipment locations if required
8. Final tests and adjustments, written report, and documentation
9. Instruction of operating personnel
10. Provision of manuals
11. Maintenance services and warranty.

1.02 RESPONSIBILITY

A. All materials, equipment, transportation, and labor necessary to achieve a complete and functionally working system as shown or inferred on the Drawings and in the Specifications. 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 or on the associated Drawings, without claim for additional payment.

B. Notwithstanding any detailed information in the Contract Documents, it is the responsibility of the Contractor to supply a full working, tested, and calibrated system. 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.

C. 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 his failure to have brought said discrepancies to the attention of the Architect.

D. Execute all work in accordance with the National Electrical Code (NEC), the National Electrical Safety Code, the Occupational Safety and Health Act (OSHA) and all applicable State and Local codes, ordinances, and regulations. 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.

1.03 RELATED WORK SPECIFIED ELSEWHERE

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A. Section 1: Submittals.
B. Section 27 1000: Voice and Data Cabling Distribution System
C. Section 27 4116: Integrated Audio/Video Systems
D. Section 16: Electrical Work.
    1. Conduit, wireways, floor boxes, wall boxes, pull boxes, junction boxes, AC power circuits and ground wiring.

1.04 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. Building Industry Consulting Service International (BICSI)
    10. Davis and Davis, Sound System Engineering (2nd Edition), Howard W. Sams, 1987
    11. Giddings, Audio System Design and Installation (ASDI), Howard W. Sams, 1990
    12. AV Installation Handbook Second Edition: The Best Practices for Quality Audiovisual Systems, Infocomm, 2009

1.05 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.

1.06 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. IP Intercom System
    1. The school IP Intercom System shall include the following features:
        a. An IP based platform.
        b. Bell Scheduling, Zone Paging, Classroom Paging, Pre-Recorded Messages and Pre Recorded Audio Tones, Music and Voice.
        c. Be password protected.
        d. Page through "Push to Talk" microphones as well as campus Voice Over IP (VOIP) System.
        e. Set up through the software to allow pages to be broadcast through the system for evacuation procedures or other instructions.

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f. Emergency announcements shall override any pre-programmed zones assuring that all emergency/lockdown/etc. are heard at all speaker locations.

g. Pre-recorded emergency announcements shall be available through soft key or dedicated push-button activation.

h. System time shall be synchronized with the network timeserver or a web-based timeserver.

i. System shall remain complete and functional in the event that the district connection is unavailable.

j. Prioritized audio from the IP intercom system shall supersede audio from any connected or adjacent audio system.

1.07 SUBMITTALS

A. Provide submittals in accordance with Conditions of the Contract and Division 1, Submittal Procedures section unless otherwise indicated.

B. 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. Manufacturer’s 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:

2) Detailed, redrawn wiring diagrams showing interconnection of components and products, wiring and cabling diagrams depicting cable types and designators,

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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.

e. Coordination Drawings:
   1) 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.
   2) 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:
   3) Equipment housings
   4) Wall mounted devices
   5) Ceiling mounted devices

f. 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.

g. Patch panel(s): Layouts and designation (labeling) strips, including color schemes.

h. Full fabrication details of any custom enclosures and millwork indicating size, material, finish and openings for equipment.

i. Projector, loudspeaker, camera mounting details, include hardware types and load capacity.

j. Fabricated Plates and Panels: 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: Equipment and cabling labeling scheme. Include font sizes and styles, explanation of scheme, and designator schedule.

l. Schedules: 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. Consultant’s project documents in electronic format will not be supplied to the Contractor for their use as part of submittals.

n. Detail drawings executed at an appropriate scale, but not smaller than 1/8 inch = 1’–0”.

o. Submissions that do not follow the format and configuration described above will be returned without review.

p. 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).

C. Resubmission requirements:
   1. Make all requested corrections or change in submittals required. Resubmit for review until no exceptions are taken.

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2. Indicate all changes that have been made other than those requested.

1.08 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.
2. Equipment Manuals:
    a. Manufacturer's owner/instruction manual for each type of Product by manufacturer and model or part number unless specified otherwise herein
    b. Supply manufacturer’s serial numbers for each Product
    c. For custom circuits or modifications, a description of the purpose, capabilities, and operation of each item
    d. 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.
3. Test Reports: Recorded findings of Commissioning.
4. 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 system capabilities.
    b. Assume the intended reader of the manual to be technically inexperienced but unfamiliar with the components and the facility.
5. 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.
6. Any other pertinent data generated during the Project or required for future service.
7. 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:
    a. Record drawings: Final rendition of Shop Drawings depicting what is actually incorporated within the Work.
    b. Hardcopy full size set of Record drawings.
    c. 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.
    d. One set of signed proof-of-training documents.
8. 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.

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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.

1.09 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

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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.

1.10 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. No less than three years experience with equipment and systems of the specified types.
2. Experience with at least three comparable scale projects within the last three years.
3. Be a franchised dealer and service facility for the manufacturer’s products furnished.
4. Maintain a fully staffed and equipped service facility with full time field technicians.
5. Have at least one supervisory on site employee having completed and certified CTS-I by Infocomm.
6. At the request of the Owner, demonstrate that:
   a. Adequate plant and equipment is available to complete the work.
   b. Adequate staff with commensurate technical experience is available.

B. 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.

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C. Coordinate exact location and installation of equipment, power, grounding, and raceway requirements with the Architect.

1.11 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.

1.12 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 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

2.01 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.

2.02 ACCEPTABLE MANUFACTURERS

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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.

2.03 INTERCOM PROCESSING

A. Main system server
   1. Basis of design:
      a. Carehawk CH-2000IP
         1) Carehawk Spotlight Software Suite

B. Intercom Control Computer
   1. Coordinate location and quantity with client
   2. Spotlight software + Computer
   3. Integrated speakers
   4. Keyboard and mouse
   5. Basis of Design:
      a. Carehawk Mapassist Touch Screen Computer 22"
         1) Spotlight software

C. Intercom Admin Console Station (ADM)
   1. Coordinate locations and quantities with client
   2. Basis of Design:
      a. Carehawk Admin Console ADMIN7

D. SIP Gateway
   1. Coordinate location and quantity with district
   2. Basis of Design:
      a. Carehawk GW2WIP1
      b. Carehawk approved equivalent

E. IP Audio Bridge
   1. Basis of Design:
      a. Carehawk SS32IP-Kit
         1) Qty: as needed
      b. Carehawk approved equivalent

F. Mobile Application
   1. Software license
   2. Basis of Design:
      a. Carehawk VCall+

G. GPIO Hub
   1. Basis of Design:

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a. Carehawk GPIO-8I-8O
    1) Qty: as needed
b. Carehawk approved equivalent

2.04 POWER AMPLIFIERS

A. Intercom Audio Amplifiers
1. Basis of Design:
a. Carehawk DAF100-25
b. Carehawk DAF300-25
c. Carehawk DAF100-70
d. Carehawk DAF300-70
e. Carehawk approved equivalent

2.05 LOUDSPEAKERS

A. Intercom Speaker (Type P1)
1. Ceiling tile speaker
2. 25V/70V
3. Taps: 0.31W, 0.63W, 1.25W, 2.5W and 5W
4. Basis of Design:
a. Quem System 12
b. Carehawk approved equivalent

B. Intercom Speaker (Type P2)
1. Type: Ceiling loudspeaker
2. Basis of Design:
a. Quam C5/BU/W
    1) Quam ERD8U
    2) Quam SSB-7
b. Carehawk approved equivalent

C. Intercom Speaker (Type P3)
1. Surface Wall mounted speaker
2. Include 25/70V transformer
3. Vandal Resistant mount
4. Taps: 0.31W, 0.63W, 1.25W, 2.5W and 5W
5. Basis of Design:
a. Quam System 1
b. Carehawk approved equivalent

D. Intercom Speaker (Type H)
1. Horn speaker
2. Flush mounted or surface mounted
3. Rated for outdoor use
4. 25V/70V
5. Taps: 0.9W, 1.8W, 3.8W, 7.5W, 15W

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6. Basis of Design:
    a. Atlas APF-15T
        1) Provide VP161-APF Vandal resistant grille
        2) Provide Atlas L20-213 for surface mount – as needed
    b. Carehawk approved equivalent

2.06 CABLES & WIRING

A. Refer to Structured Cabling Specifications 271000.

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 speaker 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 Liberty, Commscope, Gepco, and West Penn are also acceptable provided they meet the performance specifications of the approved listed cables.

H. Loudspeaker Cables - 70.7 Volt:
    1. Homerun to Amp: 14 gauge twisted pair, jacketed. Belden 5100UP
    2. Volume Control to Speaker: 16 gauge twisted pair, jacketed. Belden 5200UP
    3. Speaker to Speaker: 16 gauge twisted pair, jacketed. Belden 5200UP
    4. Acceptable Manufacturer:
        a. Belden (Model number listed above)

I. Loudspeaker Cable - 8 Ohm, 16 Ohm, 4 Ohm:
    1. Provide 14 AWG cable
    2. Cable to be CL3R or CL2P rated
    3. Jacket color: gray
    4. Acceptable Product:
        a. West Penn 226
        b. West Penn 25226 (where required)

J. 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
        b. Liberty 22-1P-EZ
        c. Belden 88761 (where required)

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d. Liberty 22-2C-PSH-WHT (where required)

K. 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. West Penn 27x Series
b. West Penn 2527x Series (where required)

L. Relay Control 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. West Penn 27x Series
b. West Penn 2527x Series (where required)

M. Other Misc. Cables:
1. Acceptable Product:
a. As per manufacturer specifications

2.07 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. ¼” Panel mount Connectors:
1. Provide panel mount ¼” connectors with unified metal shell

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2. Shell Color: Black
3. Contacts: Silver
4. Terminations: Solder
5. Acceptable Product:
    a. Female Connectors: Neutrik NJ3FP6C-BAG Series

D. ¼" Cable Connectors:
1. Provide ¼" cable connectors with die cast shell
2. No-screw type assembly
3. Chuck-type strain relief
4. Shell Color: Black
5. Contacts: Nickel
6. Terminations: Solder
7. Acceptable Product:
    a. Male Connectors: Neutrik NP3C-BAG Series

E. RCA Male Cable Connectors:
1. Provide RCA cable connectors with die cast shell
2. Shell Color: Silver
3. Contacts: Silver
4. Terminations: Solder
5. Acceptable Product:
    a. Switchcraft 3502 Series
    b. Liberty

F. Other Connectors:
1. As per manufacturers specifications

PART 3 - EXECUTION

3.01 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.

F. Perform functional testing with Owner's technology department, Owner's facilities department, and other necessary parties. All equipment to be fully functional and signed off by the Contractor, Owner(s), and any other parties. Possession of the campus warranty phase wil not take place until functionality has been fully agreed upon by aforementioned parties.

3.02 INSTALLATION

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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.

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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:

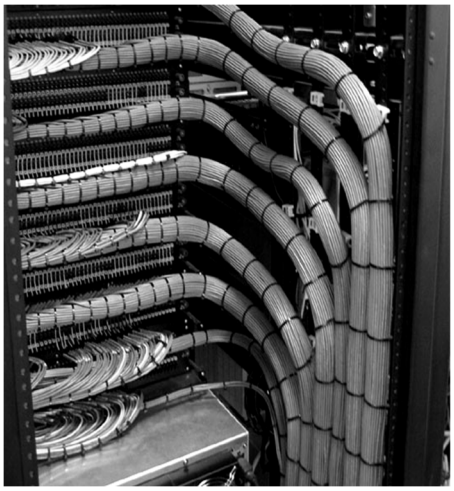
1) Phillip Giddings. Audio System Design and Installation. Indianapolis: Howard W. Sams & Co., 1990.

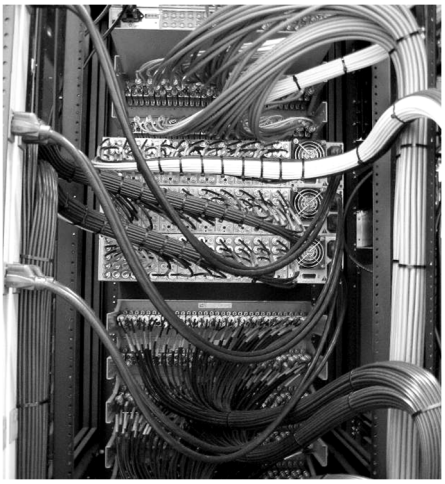
2) Don Davis and Carolyn Davis. Appendix II, Recommended Wiring Practices. Sound System Engineering, 2nd Edition. Indianapolis: Howard W. Sams & Co., 1989.

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.

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3. Custom connector plates (speaker, microphone, etc) are typically stainless steel, unless otherwise noted or specified. However, verify plate finish with the 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. Provide rear support for housing mounted equipment greater than 15 inches deep.
3. Provide blank panels to fill unused panel space within the equipment housing.
4. If Key door locks are required, key each housing type alike.
5. 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.
6. 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.
7. 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”.

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8. Panels or equipment mounted on the rear rack rails shall not block access to any front mounted components.
9. 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. Loudspeakers shall be mounted at the operating position in a safe, secure and permanent manner.
2. Rigging, mounting and support systems for loudspeakers shall be reviewed and certified by a registered Professional Engineer (PE) 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 the methods and means used to verify compliance with the original design.
3. Paint speakers, supports and related hardware color as directed by Architect.
4. The aiming direction of all loudspeakers shall be adjustable by ±5 degrees vertically.
5. Structural support members to have a safety factor of at least five. Mounting hardware and wire rope to have a safety factor of eight. All fasteners to be graded and certified for use in the intended applications. Overhead suspension hardware shall comply with ASME B30.20 standards and all applicable local building and safety codes. Overhead suspension hardware must be of a type that includes product traceability controls.
6. Provide safety cable on all bracket mounted loudspeakers.
7. All loudspeakers located in ceiling tiles shall be located in the center of the tile unless noted otherwise.

3.03 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 UL Classified to ASTM E814 (UL 1479) and shall be approved by a qualified Professional Engineer (PE), licensed (actual or reciprocal) in the state where the work is to be performed.

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.

3.04 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.

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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.

3.05 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.

3.06 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.

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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.

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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.

3.07 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

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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

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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

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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:
4.
    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.
5. 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

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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.

6. 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.

7. 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.

3.08 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 his work until the System is acceptable at no addition to the contract

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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.

3.09 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.

3.10 INSTRUCTION OF OWNER PERSONNEL

A. Provide 12 hours 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.

B. Video record all training sessions and compile a training video to be provided to the Owner on DVD.

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.

E. Cleanup and Repair

F. 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.

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END OF SECTION 27 5000

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SECTION 27 5123.13
SCHOOL CLOCK SYSTEM

PART 1 - GENERAL

1.01 SECTION INCLUDES:

A. Drawings (ES Series) and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

B. All materials, equipment, transportation, and labor necessary to achieve a complete and functional system

C. The work of this section also includes:

1. Required licenses, insurance and permits including payment of charges and fees
2. Verification of dimensions and conditions at the job site
3. Preparation of submittal information
4. Pick-up of owner furnished equipment and incorporation into project
5. Installation in accordance with the contract document, manufacturer's recommendation, and in conformity with applicable codes and authority having jurisdiction
6. Extension of electrical service, including ground, to equipment locations if required
7. Initial tests and adjustments, written report, and documentation
8. Instruction of operating personnel
9. Provision of manuals
10. Maintenance services and warranty

1.02 RESPONSIBILITY

A. 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.

B. Notwithstanding 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. Failure to provide such notification, supply items and quantities according to the intent of the Specification and Drawings, without claim for additional payment.

C. Execute all work in accordance with the National Electrical Code, the National Electrical Safety Code, the Occupational Safety and Health Act 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.

D. Conduit infrastructure system, including wire for AC Power and grounding for the systems, are provided by the contractor. Coordination between different disciplines is required to achieve a proper conduit system installation and power provisions for the Clock System. All electrical installation shall be in accordance with division 16 and the National Electric Code.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Division 26 - Electrical Work.

1. Floor boxes, wall boxes, pull boxes, junction boxes, AC power circuits and ground wiring.

1.04 REFERENCES

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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. Building Industry Consulting Service International (BICSI)

1.05 SCHOOL CLOCK SYSTEM REQUIREMENTS

A. The following is intended to further describe the Work and clarify design intent and is not an exhaustive description of the Clock systems. All work shall include:

B. The School Clock system shall be IP based with the ability to communicate through the network to accurately control the entire clock system. This shall include monitoring, display changes and other functions. Each clock shall have a unique IP address. The clock system includes "IP Clock Monitor" software which allows the user to search for the clock IP address and change each clock or all clock functions as desired. All clocks shall be POE and derive power from the IT system switches. All clocks will sync with the School District Master Clock.

C. School Clock System:
   1. Clocks and Wall Mounts for hallways and open areas.

D. School Clock System Details:
   1. Clock System shall be digital and synchronize clocks throughout the facility.
   2. Clocks shall automatically adjust for Daylight Savings Time.
   3. System shall incorporate a "fail safe" design so that one or multiple clock failures will not affect the entire system.
   4. Time of the Clocks shall be updated every 1 to 3 minutes.
   5. System shall view status of each clock to ensure proper communication.
   6. System shall provide all features stated in manufacturers specifications.
   7. Clock locations are indicated on the T drawings

1.06 SUBMITTALS

A. General: Provide submittals in accordance with the project general conditions.

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 installer 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 Installer's failure to include all required submittal information, or rejection of incomplete or improperly prepared submittal information will be the responsibility of the Installer. The cost shall be based on the hourly rates of the architect and his 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%).
   1. Provide the following in one submission for approval within thirty days of issuance of Notice to Proceed and prior to commencement of Work:

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a. Complete schedule of submittals.
b. Chronological schedule of Work in bar chart form.
c. Provide an equipment list and manufacturer's data sheets on product to be incorporated within the Work in specification order. Submit bound originals of:
    1) Manufacturer's Products technical data for each product in sufficient detail to facilitate proper evaluation to the products suitability for incorporation within the Work.
    2) Each submittal shall include a unique number and be numbered in consecutive order.
    3) Provide a complete table of contents with the following information:
        a) Project title and number
        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 be numbered in consecutive order.
        c) Date of submission.
        d) Referenced addendum or change order number as applicable.
    4) Where a data sheet shows more than one product, indicate the model being proposed with an arrow or other appropriate symbol.
    5) 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
    6) Coordination Drawings:
        a) Prepare and submit a set of coordination drawings showing major elements, components, and devices of the systems in relationship with other building components. Prepare drawings to an accurate scale of 1/8"=1'-0" or larger on suitable sized media. Enlarged detail drawings executed at an appropriate scale, not less than 1/4"=1'-0".
        b) Prepare floor plans 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
    7) Labeling: Equipment and cabling labeling scheme: Include font sizes and styles, explanation of scheme, and designator schedule.
    8) Any other pertinent data generated which is necessary to provide the Work.

C. Contract close-out submittals:
    1. Submit all close-out documents on a finalized CDR as well as a hard copy after substantial completion but prior to final inspection. The CDR shall be set up using a non-proprietary "PDF" format:
        a. Products Data: Products actually incorporated within the Work:
            1) Manufacturer's data sheet 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) Each product's Owner/Instruction Manual. Provide high quality copies where necessary, with all text legible and illustrations of equal resolution and sharpness as the original manual. Faxed copies or copies with portions of the information missing or smeared are not acceptable.

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4) Manufacturer’s maintenance and care instructions

5) 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. Record drawings: Final rendition of Shop Drawings depicting what is actually incorporated within the Work. Drawings executed at an appropriate scale, but not smaller than 1/8 inch = 1’–0”.

c. Test Reports: Recorded findings of Commissioning.

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) Describe the operation of system capabilities.

2) Assume the intended reader of the manual to be technically inexperienced and unfamiliar with this facility.

e. 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.

f. Include all site files for the system configuration and internal device settings including passwords.

g. Any other pertinent data generated during the Project or required for future service.

2. 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.

3. 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

D. 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.

1.07 QUALITY ASSURANCE

A. Qualifications: Firm experienced in the provision of systems similar in complexity to those required for this project; and meet the following:

1. Be a franchised dealer and service facility for the manufacturer’s products furnished.

2. Maintain a fully staffed and equipped service facility with full time field technicians. Have at least one supervisory employee holding the certification of CTS-I by Info Comm International (ICIA). Proof shall be supplied as submittal item.

3. At the request of the Owner, demonstrate that:

a. Adequate equipment is available to complete the work.

b. Adequate staff with commensurate technical experience is available.

B. 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.

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3. Nothing in the Contract Documents grants authority or permission to disregard or violate any legal requirements.

C. Coordinate exact location and installation of equipment, power, grounding, and raceway requirements with the Architect.

1.08 DELIVERY, STORAGE, AND 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, 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.

1.09 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.

1.10 WARRANTY

A. Warrant labor and Products 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 Products 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 eight (8) hours, and correct the deficiency within twenty-four (24) hours.

D. Provide Owner with the name and telephone number of the person to call for service. This information to be part of Project Record Drawings.

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 inspection visit with the Owner.

1.11 INSTRUCTION OF OWNER PERSONNEL

A. After final completion, provide instruction to Owner designated personnel on the operation and maintenance of the System.

B. Before Instruction begins, the contractor shall be responsible for installing the "IP Clock Monitor" software.

C. Contractor shall, thought the IP clock web interface, assign a passcode for each clock to prevent unauthorized access.

D. Contractor shall work with the local Sapling Representative to verify that all clocks are operating properly.

E. Contractor shall develop an instructional course based on the use of the system and manufacturer's recommendations. Provide a minimum of three hours of instruction.

F. Training Submittals:

1. All Operations and Maintenance manuals, as well as as-built drawings must be on site for all sessions of training.

2. Following discussions with Owner, formally submit a Training and Event Attendance submittal two weeks prior to first training. Submittal shall:

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a. Include a separate page/entry for every training session.
b. Indicate date, time, and approximate length of training session.
c. Indicate person(s) conducting training.
d. Indicate whether training will be video taped.
e. Intended curriculum and most appropriate attendees (e.g., engineer, operations, IT, etc.)
f. Include signature and title lines for:
    1) 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.
    2) Countersigning by trainer indicating that training actually occurred.
    3) 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.
    4) Owner's representative attending training at the end of the session shall initial that:
        a) Training Occurred.
        b) Training Materials were provided and left with Owner.
        c) 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.
        d) Training was generally sufficient for the proposed curriculum.
g. Include Notes section for Owner and Contractor to note any issues during training (areas requiring further development, etc.)
h. Following training occurrence, submit complete training records no later than 5 days following end of training.

G. Contractor shall be present at the first use of the facility.

PART 2 - PRODUCTS

2.01 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.

2.02 GENERAL

A. Products quantity is as required. If a quantity is given, provide at least the given amount.
    1. Products shall be new, free from defects and listed by UL when an applicable UL Standard exists. Provide Products of a given type from one manufacturer.
    2. Regardless of the length or completeness of the descriptive paragraph herein, provide Products complying with the specified manufacturer's published specifications.

B. Take care during installation to prevent scratches, dents, chips, etc.

2.03 MANUFACTURERS AND PRODUCTS

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A. If a specified product has been discontinued by a manufacturer, provide the replacement model (as certified by the manufacturer) at no additional cost.

B. Where required provide manufacturer's rack mount adapter or one manufactured by Middle Atlantic or Winstead.

2.04 CLOCKS

A. Basis of design is Carehawk.

B. Main System

1. Basis of design Carehawk CH2000

C. Wall Clock – Single Face (WC1)

1. Digital display
2. PoE
3. Basis of Design:
    a. Carehawk CLKMSL10
        1) For all athletic spaces, provide Carehawk CLKMSL22A-CAGE protective guard

D. Wall Clock – Dual Face (WC2)

1. Double sided clock
2. Digital display
3. PoE+
4. Basis of Design:
    a. Carehawk CLKMSL10D

2.05 CABLES & WIRING

A. Refer to Structured Cabling Specifications 27 1000.

PART 3 - EXECUTION

3.01 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.

3.02 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.

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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, the contractor shall install appropriate carriers to support the cabling.

g. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the contractor 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. 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.

l. 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.

m. Do not wrap cable splices or connections with adhesive backed tape.

n. Cover edges of cable and wire pass-through holes in chassis, housings, boxes, etc., with rubber grommets or Brady GRNY nylon grommetting.

o. 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. In Sound System Engineering, 2nd Edition. Indianapolis: Howard W. Sams & Co., 1989.

2. Equipment Housing Cabling and Wiring:

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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.

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 lacing twine 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 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 equipment plumb and level, firmly and safely held in place.

C. Firestop

1. 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.

2. 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.

3. Fire-stop systems shall be UL Classified to ASTM E814 (UL 1479) and shall be approved by a qualified Professional Engineer (PE), licensed (actual or reciprocal) in the state where the work is to be performed.

4. 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).

5. All fire-stop systems shall be installed in accordance with the manufacturer’s recommendations and shall be completely installed and available for inspection by the local inspection authorities prior to cable system acceptance.

3.03 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.

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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.

3.04 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.

3.05 COMMISSIONING

A. Prior to 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.
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.

3.06 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 Owner no earlier than two weeks after receipt of the written results.

B. Provide a minimum of one (1) person for inspection and one (1) person 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.

D. Testing includes operation of each major component 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.
4. Other tests on equipment or systems deemed appropriate.

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F. In the event the need for further adjustment or work becomes evident during testing, the Contractor is to continue his 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 Contractor shall pay for additional time and expenses of the Owner at the standard rate in effect at that time.

3.07 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.

3.08 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 5123.13

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SECTION 27 5129
TWO-WAY EMERGENCY COMMUNICATION SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. Design and build a two-way emergency communication system, as described in these specifications, and as prescribed by manufacturers best practices and reference guides. The two-way emergency communication system allows communication between passenger elevator lobbies (or areas of refuge) and the fire command. Throughout this specification the term “Two-way emergency communication system” refers to the communications enclosures, call stations, command units, signage, annunciators and wiring necessary to make the system operational. The System and the party contracted for this Scope of Work is referred to as the “System Installer” or “Installer” or “Contractor”. The “Project” refers to work or items provided outside the scope of this specification, but within the responsibilities of the Construction Manager, their sub- contractors, and the Project Manager. “Project” in a general context also refers to the building proper and related construction. Work that relates to the installation of the system shall be subject to the inspection and approval of the authority having jurisdiction (AHJ).

B. The System shall be manufactured, engineered, and designed by the equipment manufacturer or a current licensed design engineering partner.

C. Provision and installation of a turnkey System is required by this scope of work. The System shall include the design, furnishing and installation of the following major scope elements:

1. A solution optimized for the building in the event of an emergency and those patrons that rely upon it for emergency communications.
2. Fully compliant with IBC (2015) §1009, ADAAG §7, ICC A117.1 Ch. 7, and NFPA 72 (2016) §24.10.
3. Fully compliant with State of Texas and Harris County, Texas Building Codes.
1. Safety compliance with UL 60950-1.
4. Direct connection of Terminal Equipment (TE) to the Public Switched Telephone Network (PSTN) FCC (47 C.F.R. Part 68).
2. All components and mounting of system shall be A.D.A. compliant.
3. Furnish and install all control units, recessed enclosures, telephones, speakers, signage, wiring, annunciators, answering devices, and miscellaneous System parts.
4. Furnish and install Centralized Command Unit in the Fire Command Center/Dock Security/Check-In room ML. D2.02 of the Mezzanine Level with built-in UPS capable of supporting all call stations, control units and annunciators for 4 hours. The UPS must be equipped with network management capabilities so it can be monitored and managed over the Converged Network.
5. Furnish and install call Stations in elevator lobbies as indicated on the CS series of drawings.
6. Ordering and connection of one central office line (FXO) to the centralized command unit.
7. Jumpering, patching and connection of call stations cabling to centralized command unit using copper station cabling and copper riser backbone cabling specified elsewhere.
8. Signage (as approved by project architect) for directions on the use of the two-way communications system, instructions for summoning assistance, and written identification of the location will be posted adjacent to the two-way communication system.

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5. Coordination of installation with all the other contractors that require the System to function.
6. Coordination of planned System outages with the Construction Manager, owner, and other contractors.
7. End user, operations, and maintenance training.
8. Project warranty and associated support services required during the project warranty.

D. The Scope of Work also includes:
1. Development of low-level design drawings and documentation. Submit documentation and drawings to the Construction Manager, owner, and architect for approvals.
2. Submission of information required by public agencies or AHJ.
3. Verification of dimensions and conditions at the job site.
4. Coordination with other contractors and trades.
5. Preparation of submittal information.
6. Installation, anchorages, and attachments in accordance with the Project Manual, manufacturer's recommendations, and applicable code requirements.
7. Initial tests and adjustments, written report, and documentation.
8. Instruction of operating personnel and provision of manuals.
9. Maintenance services and warranty.
10. Support during the Project warranty.

E. The scope of work explicitly excludes:
1. Copper and Fiber backbone infrastructure and installation specified elsewhere.
2. Telephony switching infrastructure and installation specified elsewhere.
3. Security systems infrastructure and installation specified elsewhere.
4. Owner servers and applications with the exception of those needed by the System.

1.02 REFERENCED CODES AND STANDARDS:

A. Execute work in accordance with the following standards:
1. Federal Communications Commission (FCC).
2. International Organization for Standardization (ISO).
3. Institute of Electrical and Electronics Engineers (IEEE).
4. ANSI/TIA-568.0-D, Generic Telecommunications Cabling for Customer Premises, Ed. D, 09-2015.
5. ANSI/TIA-568.1-D, Commercial Building Telecommunications Cabling Standard, Ed. D, 09-2015.
6. ANSI/TIA-568-C.2, Balanced Twisted-Pair Telecommunication Cabling and Components Standard, Ed. C, Err. 04-2014.
7. TIA-569 Commercial Building Standard for Telecommunications Pathways and Spaces 05-2019.
8. TIA-606 Administration Standard for Commercial Telecommunications Infrastructure Rev C 06-2017.
9. TIA-607 Commercial Building and Grounding and Bonding Requirements for Telecommunications Rev D 07-2019.
10. National Electrical Code, including Article 800 Communications circuits.
11. American National Standards Institute (ANSI).

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12. American Society of Testing and Materials (ASTM).
13. Telecommunications Industry Association (TIA)
14. Bell System Practices (BSP).
15. Occupational Health & Safety Administration (OSHA).
16. Americans with Disabilities Act (ADA).
17. ADA Accessibility Guidelines (ADAAG).
18. International Code Council (ICC).
19. Internet Engineering Task Force (IETF).
20. International Telecommunications Union (ITU).
21. International Building Code (IBC).
22. Building Industry Consulting Services International (BICSI).
23. National Electrical Manufacturer's Association (NEMA).
24. National Fire Protection Association (NFPA).
25. Underwriters Laboratories (UL).
26. Requirements of the local Authority Having Jurisdiction (AHJ).
27. Institute of Electrical and Electronics Engineers (IEEE), IEEE 1100 Emerald Book.
28. Other codes and standards as indicated elsewhere in this document.

1.03 RELATED SECTIONS:

A. Specification sections related to the System include:
   1. Division 01 – General Requirements
   2. Division 14 – Vertical Transportation
   3. Division 26 – Electrical Systems
   4. Division 27 – Structured Cabling System
   5. Division 27 – Security
   6. Division 27 – Communications Terminal Equipment

1.04 DEFINITIONS:

A. In addition to those Definitions of Division 1, the following list of terms as used in this Section shall be defined as follows:
   1. Owner – Tomball ISD
   2. Project – Intermediate School Replacement
   3. Consultant –Technical Representative for this Section (WJHW)
   4. Architect – Huckabee
   5. End User – Tomball ISD
   6. Operator – Tomball ISD
   7. Construction Manager –
   8. Furnish – To purchase, procure, acquire, and deliver complete with related accessories.
   9. Install – To set in place, configure, join, attach, link set up or otherwise connect and test until complete before turning over to the Owner and Operator, all parts, items, or equipment supplied by Contractor.
   10. Provide or Provision – To furnish, configure and install.

B. The following terms and acronyms may be used in this specification:

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1.	AES	Advanced Encryption Standard
2.	AHJ	Authority Having Jurisdiction
3.	AP	Access Point
4.	ARP	Address Resolution Protocol
5.	AV	Audio Visual
6.	BER	Bit Error Rate
7.	BGP	Border Gateway Protocol
8.	BICSI	Building Industry Consulting Service International
9.	BMS	Building Management System
10.	BYOD	Bring Your Own Device
11.	CLI	Command Line Interface
12.	CNR	Carrier-to-Noise
13.	COS	Class of Service
14.	DES	Data Encryption Standard
15.	DHCP	Dynamic Host Configuration Protocol
16.	DNS	Domain Name System
17.	EDI	Edge Display Interface
18.	FTP	File Transfer Protocol
19.	HTTP	Hypertext Transfer Protocol
20.	ICMP	Internet Control Message Protocol
21.	IDS	Intrusion Detection System
22.	IEC	International Electrotechnical Commission
23.	IEEE	Institute of Electrical and Electronics Engineers
24.	IETF	Internet Engineering Task Force
25.	IGMP	Internet Group Management Protocol
26.	IP	Internet Protocol (often followed by a version #)
27.	IPS	Intrusion Prevention System
28.	IPTV	Internet Protocol Television
29.	ISM	Industrial, Scientific, and Medical
30.	ITU	International Telecommunication Union
31.	LAN	Local Area Network
32.	LLDP	Link Layer Discovery Protocol
33.	MAC	Media Access Control
34.	MGCP	Media Gateway Control Protocol
35.	MIMO	Multiple Input and Multiple Output
36.	NAT	Network Address Translation
37.	NETBIOS	Network Basic Input/Output System
38.	NNTP	Network News Transfer Protocol
39.	OSPF	Open Shortest Path First
40.	PAT	Port Address Translation

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41. PCI Payment Card Industry
42. PCI DSS Payment Card Industry Data Security Standard
43. PoE Power-over-Ethernet
44. QOS Quality of Service
45. RADIUS Remote Authentication Dial-In User Service
46. RF Radio Frequency
47. RMON Remote Monitoring
48. RPC Remote Procedure Call
49. RRC Radio Reservation Control
50. RSA Rivest, Shamir Adleman Algorithm
51. RSVP Resource Reservation Protocol
52. SCCP Skinny Call Control Protocol
53. SFP Small Form-Factor Pluggable
54. SIP Session Initiation Protocol
55. SMTP Simple Mail Transfer Protocol
56. SNMP Simple Network Management Protocol
57. SSID Service Set Identification
58. SSL Secure Sockets Layer
59. TACACS Terminal Access Controller Access-Control System
60. TCP Transmission Control Protocol
61. TIA Telecommunications Industry Association
62. UDP User Datagram Protocol
63. UPS Uninterruptable Power System
64. UTM Unified Threat Management
65. VLAN Virtual Local Area Network
66. VoIP Voice over Internet Protocol
67. VRF Virtual Routing and Forwarding
68. Wi-Fi Wi-Fi Alliance
69. WIPS Wireless Intrusion Prevention System
70. WJHW Wrightson, Johnson, Haddon & Williams, Inc.
71. WLAN Wireless Local Area Network

1.05 SCOPE SUMMARY:

A. The nature of this scope of work is “design-build”. The System installer is responsible for subsequent design, equipment choices and fully engineered installation details and documentation that fulfill this specification narrative, drawings, products, and related documents. The installer is responsible for making field observations necessary to determine exact mounting locations, relationships, power and heat loads and other details required for the installation of all System equipment.

B. Coordinate and schedule work with other trades, including Structured Cabling, Elevator, Telephony, Electrical and Security contractors.

C. Supply accessories and minor equipment items needed for a complete system, even if not specifically mentioned herein or on the drawings, without claim for additional payment.

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D. It is the responsibility of the Installer to supply systems in full working order according to the performance and functional requirements.

E. Obtain permits necessary for the execution of any work pertaining to the installation, or any operation by the Owner.

F. Report any conflicts between the documents and applicable codes and report to the Construction Manager. The Construction Manager will then issue a clarification. Where a conflict is discovered after the contract is awarded, propose a resolution and, upon approval, perform the work.

1.06 TWO-WAY COMMUNICATIONS SYSTEM SCOPE OF WORK:

A. The following is intended to further describe the Work and clarify design intent and is not an exhaustive description of the Two-Way Communications System. This specification requires that the Contractors bidding this project design and construct a comprehensive Two-Way Communications System solution for the project based on the design references, standards, and best practices of the manufacturer whose components are to be furnished and installed. As part of this scope of work, the System contractor is responsible for the following:

1. Furnish and install a turnkey hardwired two-way communications system between call stations located at certain elevator lobbies and the Fire Command Room/Dock Security/Check-In Room located on the Mezzanine Level (room number ML. D2.02). System quantities can be determined by reviewing the CS series of drawings and section 3.6 at the end of this specification section.
2. A system fully compliant with IBC (2015) §1009, ADAAG §7, ICC A117.1 Ch. 7, and NFPA 72 (2016) §24.10.
3. All components and mounting of system shall be A.D.A. compliant.
4. Furnish and install a central command center capable of supporting 64 call stations, 1 central office line and a 4-hour uninterruptable power supply.
5. Ordering and connection of one central office line (FXO) to centralized command unit.
6. Jumpering, patching and connection of call stations cabling to centralized command unit using copper station cabling and copper riser backbone cabling specified elsewhere.
7. Signage (as approved by project architect) for directions on the use of the two-way communications system, instructions for summoning assistance, and written identification of the location will be posted adjacent to the two-way communication system.
8. All tie wraps, bushings, trim rings, and miscellaneous parts.
9. All equipment to be installed on masonry walls shall be surface mounted. All equipment to be installed on gypsum wall board shall be flush mounted.
10. Coordination of installation with all the other contractors that require the two-way communications system to function.
11. End user, operations, and maintenance training.
12. Project warranty and associated support service required during the project warranty.

1.07 FUNCTIONALITY

B. The following depicts the basis of design functionality; however, the exact functionality may differ from manufacturer or manufacturer.

C. Local Command Unit Phone/Annunciator in the Fire Command Center/Dock Security/Check-In room (room number ML. D2.02)

1. Receive calls from one (1) of the 64 analog call stations.
2. When an incoming call has been received, the local command unit phone shall audibly ring.

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3. When an incoming call has been received, the assigned line indicator button LED shall illuminate and flash.
4. Originate calls selectively to one (1) of the 64 analog call stations.

D. Call Routing

1. The command unit shall be configurable with one of the following call routing procedures:
   a. Only route calls to the local command unit phone.
   b. Only route calls through a PSTN connection.
   c. Route calls to the local command unit phone as primary, PSTN connection as secondary.
      1) First, route a call to the local command unit phone.
      2) Secondly, if there is no answer or if there is a busy signal from the local command unit phone, then route a second call to the local command unit phone.
      3) Thirdly, if there is no answer or if there is a busy signal from the local command unit phone, then route a third call through a PSTN connection.
      4) Fourthly, if there is no answer or if there is a busy signal from the PSTN connection, then route a fourth call through a PSTN connection.
      5) Finally, if there is no answer or there is a busy signal from the PSTN connection, then continue routing the call in order and as described in the aforementioned cycle until the call is answered or the call conversation timer expires.
   d. Route calls to the PSTN connection as primary, local command unit phone as secondary.
      1) First, route a call through the PSTN connection.
      2) Secondly, if there is no answer or if there is a busy signal from PSTN connection, then route a second call through a PSTN connection.
      3) Thirdly, if there is no answer or if there is a busy signal from the PSTN connection, then route a third call to the local command unit phone.
      4) Fourthly, if there is no answer or if there is a busy signal from the local command unit phone, then route a fourth call to the local command unit phone.
      5) Finally, if there is no answer or there is a busy signal from the local command unit phone, then continue routing the call in order and as described in the aforementioned cycle until the call is answered or the call conversation timer expires.
2. Each bank of analog call stations shall be capable of queueing calls on a “first in, first out” (FIFO) basis.
   e. When a call is in session, subsequent calls on the same bank shall be placed into a FIFO queue for a given analog call station’s respective bank.
   f. When a call is completed, the next call in queue on the same bank shall be automatically placed to either an attendant at the local command unit phone or an attendant through a PSTN connection.
   g. The FIFO queues for each bank shall be independent of other banks.
   h. When the attendant terminates a call, the analog call station shall automatically return to an on-hook condition.

E. Visual Indicators (Monitoring Panels)

1. Power Status LEDs

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i. When a particular analog call station is powered, the respective bank LED shall be solidly illuminated.

j. When there is a power fault for a particular analog call station bank, the respective bank LED shall be unlit.

2. Analog Call Station LEDs

k. When an analog call station has been activated but not connected to either an attendant at the local command unit phone or an attendant through a PSTN connection, the respective analog call station LED shall be solidly illuminated.

l. When an analog call station has been activated and the call has been answered by either an attendant at the local command unit phone or an attendant through a PSTN connection, the respective analog call station LED shall be solidly illuminated.

m. Queued calls shall be indicated through the respective flashing analog call station LED.

F. Trouble LEDs

1. When an open fault or short fault occurs on an analog call station conductive pathway, the respective trouble LED shall be solidly illuminated.

2. When a system ground fault occurs, all trouble LEDs within the respective bank shall flash simultaneously.

G. PSTN LEDs

1. When there is a call connection attempt through the PSTN port, the respective PSTN LED shall flash.

2. When there is an active call connection through the PSTN port, the respective PSTN LED shall be solidly illuminated.

H. Local Command Unit Phone LEDs

1. When there is a call connection attempt through the local command unit phone port, the respective local command unit phone LED shall flash.

2. When there is an active call connection through the local command unit phone port, the respective local command unit phone LED shall be solidly illuminated.

I. Primary Power Status LED

1. When there is a loss in primary power provided to the UPS, a dedicated LED shall be solidly illuminated.

J. Visual Indicator (Strobe)

1. When an analog call station is activated, the strobe shall flash and continue for the entire duration of the call.

K. Audible Indicator (Sounder)

1. When an analog call station is activated, the sounder shall emit its configured audible signal.

2. When the call has been answered and a connection established with an attendant, the sounder shall deactivate.

L. Audible Indicator (Analog Call Station Prerecorded Voice Message)

1. An attendant at the local command unit phone or an attendant through a PSTN connection shall be capable of receiving a prerecorded voice message from the analog call station.

2. This prerecorded voice message shall notify the attendant of the analog call station location by playing at the beginning of the phone conversation.

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M. Audible Indicator (Fault Siren)

1. When an open fault or short fault occurs on an analog call station conductive pathway, the fault siren shall emit an audible signal.
2. When a system ground fault occurs, the fault siren shall emit an audible signal.

N. Trouble Reset Switch

1. The command unit shall have a trouble reset switch that can be used to:
   n. Deactivate the fault siren when any open faults, short faults, and system ground faults have been corrected.
   o. Deactivate trouble LEDs when any open faults, short faults, and system ground faults have been corrected.

1.08 PRE-CONSTRUCTION SUBMITTALS

A. Project Submittal Requirements are defined in the Project Manual. The successful Contractor must make one single, complete pre-construction Submittal package as defined and described in the General Section, with the following additional technology specific details.

1. Provide a Drawing-List of submitted drawings. Include the title of large-sheet drawings that are packaged separately. The submittal shop drawings are to be used by the Contractor as a basis for revision mark ups to create the “as-built” conditions.
   a. Execute drawings at an appropriate scale but no smaller than 1/8”.
   b. Large-sheet drawings.
      1) Submit drawings rendered in AutoCAD™ or an AutoCAD™-compatible application.
      2) Create drawings using a monochromatic scheme and industry-standard graphics with varied line types and weight so the attributes of the various elements of the image are readily discernible.
      3) Provide enlarged floor plans of rack or cabinet elevations showing equipment mounting.
      4) Provide floor plan sheets by drawing area that depict:
      5) Wiring diagrams.
      6) System cabinet and call station elevations.
      7) Notes and other details.
      8) Signage for approval by Architect.
      9) Depict any special installation/mounting details or unique means and methods necessary to successfully complete the System installation.
      10) Provide a schedule of call station equipment including, but not limited to floor, sector, elevator numbers served, IDF, cable number, patch assignment, model number and other pertinent information.
2. Submit examples of the proposed signage, labels, tags, and markers for equipment.
3. Submit appropriate cut sheets and samples for products as detailed in project specifications and drawings. Submittals shall be in written and electronic PDF format.
4. Work shall not proceed without the approval of the submitted items.
5. No substituted materials shall be installed except by written approval from the Construction Manager. Only those products that are listed as “or equivalent” in Part 2 of this specification will be considered for substitution. Substitution requests must be submitted as defined in the Project Manual. No substitutions will be considered during the submittal process.

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a. Project Submittals Requirements: The pre-construction submittal is required to verify the Contractor will obtain the specified product, understands the processes and procedures, and understands the requirements to install, test, certify and create test record documentation for the System.
b. The Submittal package is to be delivered for approval prior to commencement of Work, no later than twenty (20) days after issuance of Notice to Proceed.
c. Any submittals beyond the original submittal and one resubmittal will result in charges to the Contractor (charged for third and any subsequent reviews).
d. Additional review fees will be at the prevailing rate in effect at the time that the additional review(s) is (are) required.

6. Provide a chronological schedule of work in bar chart form. Revise and resubmit schedule as required to reflect construction progress.
7. Provide Mean Time between Failure rates on all proposed equipment.

1.09 QUALIFICATIONS

A. Project Manufacturer's Qualifications: At least 5 years' experience in the production of specified products.

B. Installer's qualifications information to be provided with Bid Response. Installer must be a certified reseller of equipment manufacturer. Provide all up-to-date certifications received from manufacturer(s). Firms and individuals must be experienced in the installation of systems similar in complexity to those required for this project and meet the following:

1. At least five years' experience with equipment and systems of the specified types.
2. Experience with at least two comparable scale projects within the last five years.
3. With the bid return, demonstrate the potential Installer has:
   a. Adequate plant and equipment to complete the work.
   b. Adequate staff with commensurate technical experience and certifications; they shall remain assigned to the project for the duration of the project.
   c. Financial status (i.e., bonding and materials purchase capacity) to meet the obligations of the work.
   d. References from three (3) or more users of similar scale projects performed by Installer including company, contact name, title, phone number and email address.

PART 2 - PRODUCTS

2.01 TWO-WAY COMMUNICATIONS SYSTEM COMMAND UNIT

A. Acceptable Manufacturers:
1. Rath Communications.
2. Talk-A-Phone.
3. As approved by owner.

2.02 TWO-WAY COMMUNICATIONS SYSTEM CALL STATIONS

A. Acceptable Manufacturers:
1. Rath Communications.
2. Talk-A-Phone.
3. As approved by owner.

2.03 TWO-WAY COMMUNICATIONS SYSTEM SIGNAGE

A. Acceptable Manufactures:

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1. Rath Communications.
2. Talk-A-Phone.
3. Other as approved by owner and project architect.

PART 3 - EXECUTION

3.01 GENERAL

A. Coordinate incorporation of the Work specified herein with other project scopes to facilitate a cohesive final product.

B. Mount equipment plumb and level.

C. Permanently installed equipment to be firmly and safely held in place. Design equipment supports to withstand loads imposed with a safety factor of at least five.

D. Take appropriate precautions against electrostatic discharge (ESD). Establish a personal ground before handling electronic equipment using a grounded wrist wrap and/or an anti-static floor pad.

E. Take appropriate precautions to protect the equipment from damage during installation. Equipment shall be installed free of damages, scratches, dents, etc.

3.02 INSTALLATION OF SYSTEM

A. Provide manufacturer-certified professional services labor for the following scope of work:

1. Provide a single project team that will manage implementation of the System as specified.
2. Coordinate any 3rd party resources or subcontractors.
3. Provide a single project manager for duration of project.
4. Prepare, maintain and update the Project Timeline.
5. Attend weekly project meetings on-site.
6. Create meeting minutes, action items and distribute.
7. Perform site survey of low voltage infrastructure and of all closets, main distribution frame (MDF), intermediate distribution frames (IDF) and other areas. Perform inspections for power, rack space, fiber connections, and other interconnection issues. Notify Construction Manager of any problems in writing.
8. Attend multiple meetings to discuss specific applications and functionality as well as technical coordination issues.
9. Attend multiple technical meetings with 3rd parties to assure technical coordination and configuration.
10. Participate in technical review meetings to assist in determining wiring requirements and providing direction to the Structured Cabling and Telephony System contractors.
11. Review business requirements and technical architecture with Operator.
12. Create design and obtain Operator and architect approval.
13. Furnish rack elevations, bills of materials and ordering information to obtain approval from Operator and Construction Manager before order.
14. Review Fire Command Center and Dock Security/Check-In room elevation and floor plan layouts and coordinate with primary security contractor and Construction Manager.
15. Coordinate the call station address plan with the Construction Manager and Operator.
16. Coordinate connectivity and interfaces for PSTN circuits.

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17. Send all submittals and surveys to Construction Manager, operator, and architect for approval prior to ordering equipment.
18. Track hardware orders, delivery dates and manage delivery issues, as required.
19. Prepare Implementation and testing plans.
20. Receive and inventory equipment at staging facility or on-site at the discretion of the Construction Manager.
21. Record serial numbers and provide to Operator and Construction Manager. Adhere asset tags if requested.
22. Unpack and assemble each device.
23. Perform off-site equipment staging, configuration, burn-in and testing.
24. Deliver equipment to secured location at job site and inventory with Construction Manager and owner.
25. Install equipment into racks if necessary.
26. Record all call station addresses, locations and elevator lobbies in an Excel spreadsheet or equivalent database.
27. Test any 3rd party applications that utilize or integrate with the system.
28. Execute test, power and UPS failover plans.
29. Perform system management and administration training.
30. Cutover System as directed by the Construction Manager.
31. Troubleshoot and optimize system.
32. Turn over complete system documentation and as-built drawings to Construction Manager and Operator.
33. Perform acceptance testing until Operator and Construction Manager is satisfied and accepts the System.
34. Ensure system is designed and operating per manufacturer's best practices and design guide references.

B. Labeling of equipment:
   1. Provide identifiers, labeling and records as required by the AHJ.
   2. Provide adhesive thermoplastic engraved labels on equipment detailing equipment identifier.
   3. Provide asset tagging for all hardware in accordance with Operator's asset tagging system/procedure.
   4. Handwritten labels are not acceptable.

C. Commissioning:
   1. Prior to testing the system ensure the following:
      a. Products are installed in proper and safe manner according to manufacturer's instructions.
      b. Dust, debris, device packaging, etc. is removed.
      c. Patch cabling and connections are dressed, routed, and labeled; connections are consistent with regard to polarity.
      d. Labeling has been provided.
      e. Products are neat, clean, and unmarred and parts securely attached.

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f. Finishes marred during installation, including ceiling tiles and supports, walls, doors, railings and previously painted surfaces, etc. have been replaced or properly repaired, and debris cleaned up and discarded.

g. Store extra materials, attic stock, equipment, tools, and spares on the premises as directed by the Operator.

3.03 ACCEPTANCE TESTING

A. Notify Operator, Construction Manager and Primary Security Contractor upon completion of the Scope of Work and system is ready for inspection and testing.

B. Provide two persons familiar with aspects of the system to assist the Owner's Representative during acceptance testing. One of the available individuals must have specialized knowledge of the System and its function within the facility.

C. The process of acceptance testing the System may necessitate moving and adjusting certain component parts; perform such adjustments without claim for additional payment.

D. Final Acceptance shall occur after system has functioned substantially for (6) Operator selected events.

1. Substantially is defined as 99.99% successful voice connections made by call stations to central command unit with no more than 50ms latency.

2. Substantially is defined as 99.99% successful voice connections made by the central command unit to call stations with no more than 50ms latency.

3. Substantially is defined as acceptance as it is described in manufacturer's reference guides and testing procedures.

4. In the event the need for further adjustment or work becomes evident during setup and/or acceptance testing, the Installer will 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, the Installer shall pay for additional time and expenses incurred by consultants or owner's representatives.

5. Final Inspection Notification Report. Provide a PDF of a tabular or spreadsheet commissioning report for each piece of equipment and the entire system including:

a. A complete listing of every piece of equipment indicating manufacturer's model number, part number and serial number, the date it was tested and by whom, the results and date re-tested (if failure occurred during any previous tests).

b. The final report shall indicate that every device tested successfully.

c. Certification indicating the System has met manufacturer testing requirements and best practices.

d. Certification that the Scope of Work is complete, physical inspection of each component of the system has been made and is properly installed, and each component is properly functioning as published by the manufacturer of the component.

E. Contract closeout submittals:

1. Keep a complete set of drawings on the job, "red lining" any changes made during installation, and submit one corrected set of reproducible drawings showing work as installed ("as-built drawings").

2. Submit the following data for review, prepared as indicated, at least one week prior to initiation of acceptance testing:

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a. System Reference Manual: Furnish in 3 ring binders, sized to hold the material plus 50% excess, with clear vinyl pockets on cover and spine for project title. Provide tabular dividers with permanent legends for the following sections.
   1) System Operation and Instructions: Prepare a complete and typical procedure for the operation of the equipment as a system, organized by subsystem or activity. This procedure should describe the operation of system capabilities and architecture. Assume the intended reader of the manual to be technically inexperienced and unfamiliar with the facility.
   2) A list of equipment indicating manufacturer, model, serial number, and equipment location. Update following acceptance testing, if changed.
   3) Manufacturer's Instruction Manuals for items of equipment, incorporating or followed by manufacturer's warranty statements.
   4) Where manufacturer registration is required, register warranty in Operators name, and at the installation address. Provide copy of registration.
   5) For custom modifications and/or custom firmware, a description of the purpose, capabilities, and operation of each item.
   6) A list of configuration settings. Update following acceptance testing. This should include all information setup/retrieved during commissioning including any dipswitch settings.
   7) Maintenance Instructions, including Installer's 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.
   8) A legend of acronyms and abbreviations must accompany documentation.
   9) Any other pertinent data generated during the Project or required for future service.

b. System functional diagrams and wiring diagrams.

c. Make any requested corrections or change in submittals required. Resubmit for review until marked "no exceptions taken" or "make corrections, no resubmission required".

d. Indicate any Installer voluntary changes that have been made to the Project.

3.04 TRAINING

A. Provide 4 hours instruction to Owner-designated personnel on the use and operation of the System by an instructor fully knowledgeable and qualified in system operation. The system reference manuals and as-built drawings should be complete and on-site at the time of this instruction. At direction of Owner a portion of training time may be deferred to end of first year as follow-up sessions to enhance Operator's ability to maximize performance of systems. Training should be assumed to take place on the project site unless other locations agreed to by the Operator. Training should be scheduled to be non- overlapping, unless agreed to by the Operator. Actual training schedule shall be by agreement with Operator. If 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.

B. The following is a general concept of the training "curriculum":
   1. A general familiarization of the System and its functionality and purpose.
   2. An explanation of how the call stations and command unit interface to each other.
   3. General training on operating the system and what LED states mean.
   4. How to perform backups and firmware upgrades if necessary

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5. Basic troubleshooting.

3.05 WARRANTY

A. Warrant labor and materials for one (1) year following the date of Final Acceptance by Operator.

B. System to be free of defects and deficiencies. Repair or replace defects occurring in labor or materials within the Warranty period without charge.

C. Register manufacturer's warranties and licenses in Operator's name.

D. This warranty is in addition to specific warranties issued by manufacturers for greater periods of time and any rights guaranteed to the Operator by law.

E. Incorporate warranty requirements into any purchase orders or subcontracts regarding any portion of the materials covered by this specification through other vendors, suppliers and/or subcontractors.

F. Respond to requests for warranty service during the Warranty Period Within the warranty period, answer service calls within eight (8) hours, and correct the problem within 24 hours.

G. Provide annual maintenance/support/break-fix costs for all itemized equipment as required in this specification and provide warranty/support/break-fix options to Operator based upon:

1. 8 hours per day, 5 days per week, next business day replacement.
2. 24 hours per day, 7 days per week, 2-hour on-site replacement.
3. No maintenance or support.

H. Annual maintenance must provide:

1. All licenses.
2. Entitlement to all software upgrades, including firmware.
3. Access to all levels of technical support, based upon problem severity.
4. Break/Fix replacement parts based upon timeframe and maintenance plan selected.
5. Access/logon credentials to support forums and self-help tools.

3.06 APPENDIX A

2 WAY COMMUNICATION SYSTEM QUANTITIES

Device	Quantity
Command Unit plus recessed wall mount kit	Refer to CS drawings
Compact Call Stations plus recessed mount kits	Refer to CS drawings
Signage	Refer to CS drawing for Call Station locations

END OF SECTION

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SECTION 28 0500
COMMON WORK RESULTS FOR ELECTRONIC SECURITY

PART 1 - GENERAL

1.01 SUMMARY

A. See individual related documents for summary of work for each section.

B. Work will consist of providing and installing prescribed systems and equipment in accordance with the Owner's directives and needs. The Contractor will design, install, and configure systems to provide the exact function described herein, when specified, and will be held to the operational criteria. The Contractor will be responsible for providing and installing a complete and fully operational system, with the intended features and capabilities, whether or not all required parts, components, systems, or accessories are specified in the construction documents. The Contractor will provide all required parts, components, systems, materials, accessories, and programming needed for a complete working system, without additional cost to the Owner.

C. Although such work is not specifically indicated, provide, and install supplementary or miscellaneous items, appurtenances, and devices incidental to, or necessary for, a sound, secure, and complete installation.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including all General and Supplementary Conditions and Division 1 Specification sections, will apply to this section and will be considered as forming an integral part of this Work. These documents are referred to as the Project General Conditions in the remainder of these Specifications. Where the Project General Conditions conflict with the requirements defined herein, the more stringent of the requirements and the Project General Conditions will prevail.

B. This Specification Section incorporates general requirements for the following security sections:

1. 28 0513 Conductors and Cables for Electronic Security
2. 28 1000 Access Control

1.03 RELATED WORK NOT IN THIS SECTION

A. General and specific provisions of these Specifications apply to the work specified in this Section, as well as:

1. Mockups
2. Division 07 Firestopping
3. Division 08 Door Hardware
4. Division 26 Electrical
5. Division 27 Structured Cabling and Pathways

1.04 DEFINITIONS

A. Owner's Representative: The representative, or representatives, appointed by the Owner responsible for project construction supervision.

B. Provide: To purchase, deliver to site, and furnish all labor and material as necessary for a complete and operational system as specified herein.

C. Contractor: The Party contracted by the Owner or their designated representative to Provide Work specified herein.

D. Contract Documents: Documents used to specify the Work and govern the work of the Contractor in their entirety or in part.

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E. Work: The entire completed construction of the individual parts of the project as specified herein.

F. Local Authority Having Jurisdiction: The local governmental entity responsible for adopting and enforcing all code requirements at the location Work is being performed.

G. Project General Conditions: Include all relevant contractual requirements for the Project to include Division 1 General Conditions as well as Owner-provided and established contractual provisions.

H. Security Subsystem Specifications: Those specifications that apply to security subsystems for which these General Security Requirements apply.

I. The following are definitions utilized within this specification section:

1. ACS: Access Control System
2. VMS: Video Management System
3. GUI: Graphical User Interface
4. IP: Internet Protocol
5. KVM: Keyboard Video Mouse
6. UI: User Interface

1.05 SOFTWARE AND NETWORK

A. Custom Software Overview:

1. Integration of the Division 28 sections, including programming and development of any custom software that may be required of this section, is the responsibility of the Contractor(s). It is the responsibility of the Contractor(s) to work with the Owner and manufacturer(s) to develop these integrations. When custom modules are required, it will be the responsibility of the Contractor(s) to coordinate with manufacturer(s) for APIs and SDKs to have the programs written.
    a. Custom software programming must be contracted to the manufacturer to write; however, the expense of the development will be the responsibility of this section.
    b. Any custom software developed for this project shall be maintained for changes to all systems integrated for a minimum of five (5) years after completion of the project.

1.06 REFERENCES

A. American National Standards Institute (ANSI)

B. Electronic Industry Association (EIA)

C. National Electric Code (NEC)

D. Telecommunications Industry Association (TIA)

E. National Electrical Manufacturer’s Association (NEMA)

F. Underwriters Laboratories (UL)

G. National Fire Protection Association (NFPA)

H. Federal Communications Commission (FCC)

I. Institute of Electrical and Electronics Engineers (IEEE)

J. Occupational and Safety Health Administration (OSHA)

K. Open Network Video Interface (ONVIF)

1.07 APPLICABLE CODES AND STANDARDS

A. The Contractor will ensure that all Work provided under this section will meet the minimum requirements of all applicable codes and standards, as determined by the LAHJ.

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B. Where the requirements of this section exceed the minimum requirements of the LAHJ, this section will govern. Where codes conflict with the Contract Documents, codes will govern. Where any applicable codes and standards conflict between themselves, the more stringent will apply.

C. Nothing in this section will relieve the Contractor from the responsibility for compliance with all applicable codes, standards, or specifications which are generally recognized to be applicable to the Work specified herein.

D. The Contractor will make application for, and obtain, any and all permits required by federal, state, county, city or other LAHJ over the work. In the event inspections are required, it will be the responsibility of the Contractor to schedule and ensure the completion of said inspections, and to ensure that all necessary certificates are issued, obtained, and delivered to the Owner.

E. Within this Section and the Security Subsystem Specifications, reference is made to United States-based standards, codes, and legislation. For projects outside the United States, the corresponding local codes, standards, and legislation will apply, except where local requirements are less stringent than those proscribed within the referenced United States requirements. In these cases, the referenced United States requirements will apply.

1.08 SUBMITTALS

A. General Submittal:

1. Coordination is required with the Contractor for complete shop drawings and submittal packages.
2. Provide simultaneously the following for approval thirty (30) days after issuance of notice to proceed and prior to commencement of work:
    a. Complete schedule of submittals.
    b. Chronological schedule of work in bar chart form.
3. Submittal format:
    a. Provide a unique control number in consecutive order.
    b. Provide a complete table of contents with the following information:
        1) Project title and number.
        2) Submittal number.
            a) 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:
        1) Index by the data in specification order, manufacturer, and model or part number unless specified otherwise herein.
    f. Each submission page stamped with Contractor’s certification stamp, initialed, or signed certifying:
        1) Review, approval, and acceptance of submission.
        2) Certification of product compliance to specification.
        3) Verification products may be incorporated within the work.
    g. Arrange product data list in specification order when applicable followed by unspecified product arrange by manufacturer and model or part number. Follow list

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by manufacturer’s data sheets, arranged in the same order. Where a data sheet shows more than one product, indicate the model being proposed with an arrow or other appropriate symbol.

h. Drawings executed at an appropriate scale, but not smaller than 1/8” = 1’-0”. Provide one (1) electronic, flattened, copy of the reproducible which will be returned to Contractor.

i. Submittal documents shall be computer generated. Free-hand sketches or reproductions of Contract Documents will not be acceptable, and Contractor will be deemed non-responsive.

B. Prefabrication as required within these specifications:

1. Prefabrication submittals will be submitted in English in addition to the local language. Submittals not translated to English will be rejected without review.

2. Prefabrication submittals will completely demonstrate the Contractor’s understanding and interpretation of the systems, equipment, devices, and components being installed. Prefabrication submittals will consist of shop drawings and product data as defined herein. Submittals will clearly show materials, dimensions, operational features, durability, technical limitations and requirements, and all other information required for a complete and thorough review.

3. Acceptance of prefabrication submittals by the Owner’s Representative will not relieve the Contractor from any responsibility to Provide Work as defined in the Contract Documents. No portion of the Work will commence until the Owner’s Representative has approved the prefabrication submittals in writing.

4. All prefabrication submittals will be submitted by the Contractor in their complete form. Partial submittals will not be considered.

C. Informative Submittal:

1. This submittal is intended to be used when using specified equipment.

2. Product Data:

a. Provide a list of, and the manufacturer’s data sheets on, product(s) to be incorporated within the work:

1) Manufacturer's product technical datasheet for each product in sufficient detail to facilitate proper evaluation of the products suitability for incorporation within the work. Where multiple products are shown on the same datasheet the product intended to be used shall be identified in a manner that can be photocopied in black and white.

2) Manufacturer's wiring diagram for electrically actuated units in sufficient detail to facilitate proper evaluation of the products suitability for incorporation within the work.

3) Organize the data sheets in the order of the specification.

3. Shop Drawings:

a. See below.

4. Samples, if required by Owner or Architect.

D. Action Submittal:

1. This submittal is intended to be used when a substitution of product(s) is requested.

2. Product Data:

a. Provide a list of, and manufacturer’s data sheets on, product(s) to be incorporated within the work:

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1) Manufacturer’s product technical datasheet for each product in sufficient detail to facilitate proper evaluation of the product’s suitability for incorporation within the work. Where multiple products are shown on the same datasheet, the product intended to be used shall be identified in a manner that can be photocopied in black and white.
2) Manufacturer's wiring diagram for electrically actuated units in sufficient detail to facilitate proper evaluation of the products suitability for incorporation within the work.
3) Organize the data sheets in the order of the specification.

3. Comparison Matrix:
   a. Provide a Matrix showing the features of the specified product in one column with the next column depicting how the proposed item’s features compared.
   b. Highlight any item that does not exceed the specification or feature of the specified device.
   c. Provide documentation showing the device being substituted is on the approved devices list:
      1) If a generic ONVIF driver is used, the Contractor will show that the substituted product will have the same quality and features as the native driver for the originally specified product.
4. Shop Drawings:
   a. See below.
5. Samples, if required by Owner or Architect.

E. Resubmittal:
1. Make any requested corrections or changes in submittals required. Resubmit for review until no exceptions are taken.
   a. Indicate any changes that have been made other than those requested. Identify each change or correction with the appropriate delta identifier and cloud the change.

F. Shop Drawings Submittal:
1. Shop Drawings will be computer generated in AutoCAD® Revit. Coordinate version with the Owner’s Representative. Drawings will be precisely scaled. Free-hand sketches or reproductions of the Contract Documents will not be acceptable, and the Contractor will be deemed nonresponsive.
2. PDF prints will be produced of all sheets and organized following the architectural numbering format.
3. Coordinate with the Owner’s Representative to obtain architectural model/backgrounds in electronic or hardcopy format for use in the Shop Drawings.
4. Shop Drawings will consist of, at a minimum, the following:
   a. Floor plan drawings indicating the location of all security devices as well as all wire runs and designations.
   b. Plans, elevations, and details indicating dimensions, gauges, reinforcement, anchorage, and other installation details for each device as required.
   c. System point-to-point diagram indicating the inter-relationship of all security system peripheral devices, control panels, software/monitoring workstations, and other components as necessary for a complete and operational system.
   d. Wiring Diagrams:

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1) The manufacturer's wiring diagram for each type of product actually incorporated.
2) Typical wiring diagrams for each system peripheral device.
3) Specific wiring diagrams for each system control panel, power supply, video recorder or other device or equipment that controls or communicates with multiple peripheral devices.
4) For custom circuits or modifications, a description of the purpose, capabilities, and operation of each item.

e. Fabrication shop drawings for all custom equipment.

f. Installation: Special details depicting methods and means specific to each product, assembly, and each product manufacturer's recommended installation methods and means.

g. Equipment: Location of equipment, with dimensions; wire routing and cabling within housings, AC power outlet, and terminal strip locations. This will include equipment closet layouts, power inserters, camera power supplies etc.

h. Camera mounting details for each camera position. Each mounting detail will contain sufficient scaled detail to indicate the entire coverage area and attachments.

i. Control software screens. Provide color printouts of screen layout for camera, floor layouts, and controls. This requirement is to be coordinated with the GUI development process.

j. Fabricated plates and panels: Provide complete drawings on custom fabricated plates or panels. Drawings to include dimensioned locations of components, component types, engraving information, plate material and color, and bill of material.

k. Labeling: Representative equipment and cabling labeling scheme. Include font sizes and styles, explanation of scheme, descriptor, and designator schedule.

l. Any other pertinent data generated which is necessary to provide the Work.

m. Seek the services of a state licensed structural engineer to stamp and approve mounting details of cameras mounted on any location requiring a foundation, dedicated poles (such as outside locations), or where the objects are mounted over seating areas.

n. Copying Contract Documents and submitting them as Shop Drawings will be considered as non-responsive.

G. Record Documents Submittal:

1. The Contractor will submit Record Documentation for the Project subsequent to substantial completion and prior to final inspection.
2. Provide all Record Documents in digital format via USB thumb drive.
3. All PDF files must be flattened so any notes or comments are not able to be moved or deleted accidentally when selected.
4. Record Documents will consist of, at a minimum, the following:
   a. Operations & Maintenance manuals.
      1) Provide Operations & Maintenance manuals in accordance with the Project General Conditions or as specified in this Section. Where there are conflicts between the Project General Conditions and this Section, provide in accordance with the stricter requirements between Sections:
         a) Where not addressed in other Sections, provide per this specification Section.

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b) See Security Subsystem Specifications for any additional requirements.

2) All product data for the Project will be tabulated into a comprehensive list of equipment to be provided for the Project, including quantities, manufacturer names, model numbers, description, and any applicable options. The product data submittal will be of sufficient detail so that the Owner's Representative may readily identify the equipment and materials proposed.

3) Reference both manufacturer and Construction Document identification.

4) Product data sheets for each piece of equipment included in the project identifying the following:

a) Identify all Parts and Components by name and manufacturer's part number:

(1) Manufacturer's data sheets for each type of product conforming to the scheme specified herein. The Contractor will submit original brochures; copies will not be acceptable. Where information is in color, all copies will be provided in color.

(2) Manufacturer's serial numbers.

b) Materials and Fabrication.

c) Tolerances.

d) Power and environmental / HVAC requirements.

e) Special criteria related to particular systems and components.

f) Specifically, and clearly, mark items submitted where multiple items and options occur on a sheet.

b. Schedules: Independently identifies each piece of equipment, component, and device provided for the project; including project name/number reference, product name and number, installation location, and conductor/cable identifications that devices are connected to.

1) For information submitted in a schedule, include information independently in an organized and consistent format.

2) Provide programming point information within the schedules

a) Submit color samples for specific pieces of equipment at the request of the Owner's Representative and as identified in Security Subsystem Specifications.

c. As-Built Drawings: Final rendition of submission depicting what is actually incorporated within the Work as defined in the section titled "Record Documentation" herein.

d. Wiring Diagrams:

1) The manufacturer's wiring diagram for each type of product actually incorporated.

2) Typical wiring diagrams for each system peripheral device.

3) Specific wiring diagrams for each system control panel, power supply, video recorder or other device or equipment that controls or communicates with multiple peripheral devices.

4) For custom circuits or modifications, a description of the purpose, capabilities, and operation of each item.

e. Test Reports: Recorded findings of the Contractor's commissioning.

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1) Where test data is required by the Security Subsystem Specifications or Project General Conditions, all tests must be specific to products supplied within the Work.
2) Provide a manufacturer's certification certifying that product(s) meet or exceed specified requirements.
3) Indicate application conditions and limitations of use stipulated by the Product testing agency.

f. 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 and unfamiliar with this facility.

g. Maintenance Instructions:
1) Maintenance phone number(s) and hours
2) Maintenance schedule
3) Manufacturer's maintenance and care instructions
4) 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.

5. The Owner's Representative will have the right to request additional information as required for a proper review of the submittal information.

1.09 MAINTENANCE MATERIAL SUBMITTAL

A. Copy of Maintenance contracts.
B. Operation and Maintenance Manual and Schedule.

1.10 CLOSEOUT SUBMITTAL

A. Copy of Maintenance contracts.
B. Operation and Maintenance Manual and Schedule.
C. Bonds.
D. Warranty Documentation.
E. Record Documentation.
F. Copy of software.

1.11 SITE DOCUMENTATION

A. The Contractor will maintain up-to-date Record Drawings on site for inspection by the Owner's Representative. Each change to the original approved submittal data and deviation from the Contract Documents will be indicated on the record drawings. The Contractor will ensure that the record drawings are protected against soiling, tears, or other damage or defacement. At the conclusion of the Project, the Contractor will incorporate all changes on the Record Drawings into electronic format and will submit the completed set as As-Built documentation as defined in the section titled "Record Documentation" herein.

1.12 QUALITY ASSURANCE

A. The Contractor will have a minimum of five (5) years of experience in the design, installation, and commissioning of projects of a similar nature. The Contractor will provide evidence of completion of at least two (2) projects of a similar size which have been in operation a minimum of one (1) year.

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B. The Contractor will be equipped to support the Project from a local field office. The office will offer twenty-four (24) hour emergency service with a maximum response time of four (4) hours. The Contractor will have an in-depth understanding of all local codes and requirements for the area that the Project is located in.

C. The Contractor will be an authorized dealer of each of the major access control, intrusion detection, and video product lines specified in the associated specification sections. The Contractor will provide written proof of dealership status along with bid.

D. In addition to experience requirements stated, the Owner's Representative reserves the right to require:

1. Site visit to at least two (2) facilities where installations have occurred and are in use.
2. Owner approval.
3. Surety bond backed warranty.
4. Proof that the Contractor or bidder is familiar with installations to be made.
5. Background information on prior installations, including the following information:
    a. Owner, Architect, and Contractor contacts
    b. Names
    c. Phone numbers
    d. Addresses

1.13 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products in accordance with manufacturer's recommendations, so as to minimize the opportunity for damage, deterioration, or loss.

B. The Owner assumes no liability or responsibility for loss by theft, vandalism, or burglary of material or equipment stored on site.

C. Deliver all equipment and material to the site in the manufacturer's original sealed packaging. Packaging is to provide factory identification of items contained within the packaging and protection until the items or materials are installed. Inspect all equipment and material upon delivery to ensure that they are free from damage and in accordance with the Contract Documents.

D. Store products in their original packaging until installation. Protect from spoilage, moisture, all weather-related conditions, corrosion, breakage, or other damaging elements. Store in conditions that will ensure all required manufacturer's environmental criteria are maintained until use of material or products.

E. Replace, at no expense to Owner, product damaged during storage, handling, or the course of construction.

F. Acceptance of the products constitutes the Contractor's acknowledgment that products or materials are satisfactory for use.

1.14 TECHNICAL SYSTEMS SOFTWARE LICENSE

A. Introduction:

1. All proprietary software provided for the Technical Systems will be subject to this software license agreement 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. The Contractor will agree that 3rd party (e.g., manufacturer's) proprietary software provided with the system will be subject to this agreement.

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3. The Contractor and Owner agree this software license is deemed to be part of, and subject to, the terms of the Agreement applicable to both parties and will supersede any standard manufacturer or Contractor's standard license agreement.
4. Proprietary software will 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® will not be considered "proprietary" software, unless a non-public version of MS Windows®, or any of its components, are critical to the operation of the system in which case it will be deemed proprietary.

B. License Grant and Ownership:
1. The Contractor hereby grants to the Owner a perpetual, non-exclusive, site license to all software for the Customer's use in connection with the establishment, use, maintenance, and modification of the system implemented by the Contractor. Software will 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 paragraph, the Contractor, at all times, will 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 will be delivered to the Owner for the sole benefit of the Owner.
3. The Owner may supply to the 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 the Contractor. All such intellectual property will remain the exclusive property of the Owner and will not be used by the Contractor for any purposes other than those associated with delivery of the system.
4. The Contractor shall provide all licenses or modules to make the system fully functional.

C. Copies, Modification, and Use
1. Source code will be available to the Owner for a period of not less than ten (10) years.
2. The 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 will remain within the direct control of the Owner and its representatives.
3. The 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 in the 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 will be deemed null and void in case of any modification to the software made by any party other than the Contractor.
5. During the life of the system (defined as a period of not less than ten [10] years and not more than fifteen [15] years), the Contractor will provide software updates in accordance with all necessary support requirements to maintain the system. This will include a commitment to provide appropriate patches, fixes, and interface updates as necessary to maintain the operability and security of the system at a level commensurate with the original system:

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a. In the event computer and/or processor hardware refinements and updates are necessary to support software updates five (5) years after substantial completion, said hardware will be provided to the Owner at negotiated terms between the Contractor and the Owner.

b. Labor will be in accordance with change order rates of the original contract, as adjusted for inflation in accordance with conditions and limitations of the general Contractor or U.S. Bureau of Labor Statistics' Consumer Price Index (CPI).

6. All hardware supplied will support software updates for a period of not less than five (5) years following substantial completion.

PART 2 - PRODUCTS

2.01 MATERIALS, EQUIPMENT, AND DEVICES

A. Herein, and within the related Sections of Work identified herein, performance requirements and other specifications related to equipment to be provided as part of this Project are listed. The Contractor will refer to the identified product or a known equal for acceptable manufacturers of equipment.

B. "Or Approved Equal" basis:

1. The products are listed on an "or approved equal" basis. The known equals to the products specified are listed in each section.

2. Substitute products not listed in this section may be submitted for approval during the question-and-answer period of the bidding phase. See Action Submittal requirements in this section.

3. Substitution approvals will be based on the complete functionality, integration, operation, and user interface as compared to the specified product(s).

a. If a substitute product is approved, the Contractor is solely responsible for integrating it to meet the operational intent of the originally specified product.

4. Products not approved prior to the bidding phase will be deemed nonresponsive.

C. Provide products of types, materials, sizes, capacities, and electrical characteristics as indicated. Products will meet the following requirements:

1. Design and construction will be as recommended by the manufacturer and as required for installation.

2. Provide manufacturer's standard product as indicated by published product information.

D. Where special power treatment is required, such as filtering or spike elimination that may be required for proper operation of the system, the Contractor will provide as part of the system.

E. Acceptable products will be as indicated in each section. All products will meet the following requirements:

1. The manufacturer will have a minimum of five (5) years' experience producing the specific types of products to be used.

2. All like equipment, components, and devices will be by one (1) manufacturer where possible, unless the major component manufacturer does not provide a specific device (example; 180° or 360° camera).

3. Where different manufacturers must be provided, all products will be totally compatible.

F. Where specific model numbers are not provided for a specific manufacturer, information is provided to indicate the level of quality to be met by other approved manufacturers:

1. Systems provided are to be factory designed, independently tested, published components; coordinated, designed, and interfaced to perform as one unitized system.

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2. Include all required wire, cable, fittings, and miscellaneous accessories.
3. Unless specifically noted, components and system logic will be provided through microprocessors and pre-designed cards.
4. Provide low voltage components and devices where possible.
5. Provide only systems designed for continuous 24-hour, 7 days a week operation.

2.02 FABRICATION

A. Electronic Equipment and Components:
   1. To the greatest extent possible, provide standard equipment and components, designed to operate as complete coordinated systems capable of interfacing with all related systems required for the work.
   2. Where custom fabricated and integrated systems or components, such as vehicular pedestals, are required or indicated, provide compatible components and complete system to attain performance and operational capabilities intended.

B. Factory finish all components:
   1. Where selected color is not specifically identified in contract documents, submit sample materials finished with actual colors and textures. The Contractor will submit for approval the full range of colors and textures for approval by the Owner's Representative.
   2. See Security Subsystem Sections for specific finishes.

C. Provide factory-fabricated wire of the size, rating, material, and type as indicated for each service. Where not indicated, provide proper selection as required to comply with installation requirements and with local standards adopted by LAHJ.

PART 3 - EXECUTION

3.01 EXAMINATION AND SITE PREPARATION

A. Prior to bidding, examine the project (if under construction) for nature, scope, and intent of all work to be performed and notify the Owner's Representative, in writing, of any conditions determined to be detrimental to proper completion of the Work.

B. Submission of a bid/proposal will constitute that examination has been made and any difficulties foreseen are identified and noted. Any claims for labor, work, materials, or equipment for difficulties encountered which should have been foreseen will not be recognized and will be taken care of by the Contractor at no additional cost to the Owner.

C. Do not proceed with Work until all unsatisfactory conditions have been corrected.

D. Prior to the installation of systems components and devices, verify all required preparations have properly occurred and those substrates are acceptable for installation:
   1. Verify all rough-ins and field dimensions.
   2. Report any discrepancies, unsatisfactory conditions, and prevailing conditions that will adversely affect satisfactory execution of work for systems included under this specification section.
      a. Do not proceed with Work until unsatisfactory conditions have been corrected.
      b. Owner's Representative reserves the right to review proposed methods of direction, reject proposed methods and have the installation done in a satisfactory method at the Contractor's cost.
      c. Installation constitutes acceptance of responsibility for performance.

3.02 INSTALLATION

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A. Install all system components in accordance with manufacturer's written instructions, in compliance with all applicable codes and standards, and in accordance with recognized industry practices.

B. Ensure that all equipment is properly installed to avoid mechanical stresses, twisting, or misalignment of equipment that may be exerted by clamps, supports, and cabling.

C. Thoroughly clean all areas and spaces where work is performed or used as access to work. Completely remove all paints, mortars, oils, or other residues and otherwise restore all surfaces to their original condition. Upon completion of the work, remove refuse and rubbish from, and about, areas of work. Repair any damage caused to the premises by the installation of systems at no cost to the Owner.

D. Grounding:

1. Provide equipment grounding connections for all systems as indicated herein and in the Contract Documents. Ensure and demonstrate that resistance to solid earth for signals is less than or equal to three (3) ohms.
2. In no event will the AC neutral conductor, either in a power panel or in receptacle outlets, be used for a reference ground.
3. Ground all equipment in accordance with the manufacturers' requirements. The Contractor will be responsible for diagnosis and correction of all problems related to improper grounding, including that which causes damage to equipment.

E. All equipment will be installed square and plumb. Ensure that all equipment is clean and free of paint and other foreign materials.

F. All installation practices will adhere to all applicable regulations, codes, ordinances, and standards as required by the LAHJ.

G. Clearly identify points of connection for wiring from building power system to work of this section, and requirements for connection to materials and equipment supplied under other Sections of Work.

H. Provide all transformers, relays, and other accessories as required for a complete and operational system as defined herein and as required by the Security Subsystem Specifications. Furnish and install all fastenings, plates, and other incidental items required for complete and operational installation.

I. Labeling: All cables will be permanently labeled at their point of termination with mechanically produced labels. Label text will match that indicated on the record drawings.

J. The Contractor will ensure that all equipment installations and mounting are in strict accordance with requirements for applicable seismic classification.

K. Prior to installation, ensure that each installation area meets the following conditions:

1. All wet work is completed.
2. Area is dust free.
3. All work regarding painting is completed.

L. Anchor components securely in place, plumb, level, and accurately aligned. Provide separators and isolators to prevent corrosion and electrolytic deterioration.

M. Protect installed equipment from damage and spoilage.

N. Touch up minor scratches and abrasions with manufacturer's touch-up paint, as necessary.

O. Double-sided foam tape will not be used to secure any terminal boxes, relay bases, or circuit boards, etc.

P. All device mounting will be of a permanent nature.

Q. During installation, care will be exercised at all times to protect the Owner's property.

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3.03 COORDINATION

A. Coordinate all Work to be performed with the General Contractor as necessary for smooth and expedient completion. Ensure critical path to completion where Work specified herein in dependent upon completion of Work by other trades or by the Owner. Coordinate with other trades to avoid conflicts where Work in a certain area requires exclusive use of the area for the duration of the Work.

B. Coordinate arrangement and quantity of security-related assemblies with ceiling space configuration and with other components occupying ceiling space, including structural members, ductwork, electrical raceways, lighting fixtures and other items.

C. Furnish any inserts required for building into concrete, masonry, and other work to support and attach work of this section. Furnish in ample time to comply with schedule of work into which inserts are built.

D. Program the system in accordance with the Owner's instructions and with the requirements of this Section.

1. The Contractor shall schedule a programming coordination meeting with the Owner prior to the programming of systems in order to determine and meet the Owner operational standards.

3.04 SYSTEM STARTUP

A. Subsequent to installation, clean each system component of dirt, dust, oils, and other residues incurred from project activities and prepare the system for activation by following each manufacturer's recommended procedures for adjustment, alignment, and synchronization.

B. Program the system in accordance with the Owner's instructions and with the requirements of this Section.

3.05 SYSTEM TEST AND VERIFICATIONS

A. Prior to energizing or testing the system, ensure the following:

1. All products are installed in a proper and safe manner according to the manufacturer's instructions.
2. Insulation and shrink tubing are present where required.
3. Dust, debris, solder splatter, etc. are 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.

C. The Contractor will coordinate with the Owner's Representative for final tests and inspections in the presence of the Owner and other representatives as the Owner's Representative deems appropriate.

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D. The Contractor will develop a Final Test and Acceptance (FTAA) Plan. The plan will include the following components:
   1. The Contractor will produce an item-by-item completion matrix indicating completion or incompletion for each item included in this Section and any additional direction, addenda, or bulletins issued by the Owner's Representative. For each incomplete item, indicate the date of completion.
   2. The FTAA Plan will incorporate Owner-provided startup checklists and will follow the Owner standards.
   3. The Contractor will perform a complete test of the systems installed to include visual inspections and operational tests of all components. The Contractor will submit a report of the test to include system reports produced by the system software for each of the components tested and visual inspection reports for each component.
   4. FTAA Plan will identify each component of the system, intent of test, method(s) of test, and expected results. Each component listed in the plan will include space for test part signatures, brief comments, time of test, and pass/fail check boxes.
   5. The FTAA plan will be submitted to the Owner's Representative thirty (30) days prior to the scheduled final test.

E. The Contractor will ensure the system is on and fully operational prior to the start of the test. The Contractor will provide a minimum of two (2) employees to conduct the test, one of whom will operate software and other head-end equipment while the other accompanies the Owner's Representative.

F. The Owner's Representative will observe a complete and thorough demonstration of the systems for compliance and issue a final report. Once all items in the report deemed non-operational or non-compliant with the Specification have been corrected and verified by the Owner's Representative, the systems will be deemed acceptable.

G. 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 or failed 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.

H. Provide manufacturer's supervision of final testing of each system.

I. Each system must test free from interference, opens, grounds, and short circuits.

J. Following completion of the Final Test, the system will undergo a thirty (30) day Operational Demonstration Test (ODT) or Burn-In period. This operational demonstration period will start when all specified systems and equipment have been installed and "Substantial Completion" is reached, with no more than a moderate number of punch list items remaining. During this period, the system will be operated under a normal facility traffic load for no less than thirty (30) days. If any item or system fails during the ODT, the 30-day burn-in period will be suspended for that item until repaired or replaced. Once repaired or replaced, the burn-in period will recommence. Final system acceptance of the entire project will be withheld until after successful completion of this operational demonstration period for all systems and components.

3.06 RECORD DOCUMENTATION

A. Subsequent to completion, the Contractor will submit Record Documentation for the Project. Record Documentation will consist of operation & maintenance manuals, As-Built drawings, and a document deviation log. All Record Documentation will be submitted in hard copy and digital format. Record documentation will meet the following requirements:
   1. Provide all Record Documents in digital format via USB thumb drive.

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a. All PDF files must be flattened so that any notes or comments are not able to be moved accidentally when selected.

B. Operations & Maintenance manuals will meet the following requirements:

1. Divide into sections for each system, clearly demarcated by a divider titled with the system:
   a. Provide each divider with a tab.
   b. Title each divider with machine print, no smaller than 12-point, to match tabs.
2. Each section will be sub-divided into consistent sub-sections of information:
   a. Provide each section with a table of contents.
   b. Follow each table of contents with contact person(s) information including their name, responsibility, phone number, and address.
   c. Provide a section with a list of equipment, devices, and components included in the section.
   d. Include in the list the manufacturer, parts number, and contact person(s) to call for questions on each item.
   e. Follow the list provided with technical information on each listed item, in the order of the list:
      1) Product data sheets which include but are not limited to pictures, descriptions, dimensions, electrical diagrams, circuit board layouts, etc.
      2) Product specifications including but not limited to power requirements, operational criteria, environmental requirements, optical descriptions, etc.
   f. Provide information related to the operation of equipment, devices, and components:
      1) Provided information will be specific to the product models actually installed on the project.
      2) Provide information as presented during the training sessions for each system provided for the facility.
   g. Provide complete information required for care and maintenance of all equipment, devices, and components installed on the project. Information will include, but is not limited to:
      1) Cleaning: Special procedures or use of special chemicals.
      2) Maintaining: Maintenance schedules and tasks, application of products critical to proper operation, types of environmental conditions which need to be maintained or avoided.
      3) Trouble Shooting: Instructions for how to proceed should a problem occur, method of determining the seriousness of the problem, repair instructions for minor problems.
   h. Provide other Project Specific Information:
      1) List of wires, color codes, description of type, tag identification reference.
      2) As-Built drawings.
   i. Provide Operations & Maintenance manuals in accordance with the Project General Conditions or as specified in this Section. Where there are conflicts between the Project General Conditions and this Section, provide in accordance with the stricter requirements between the Sections:
      1) Where not addressed in other Sections, provide per this specification Section.
      2) See Security Subsystem Specifications for any additional requirements.

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C. As-Built drawings will meet the following requirements:
   1. As-Built drawings will consist of all information indicated under the section herein entitled “Shop Drawings” but updated to include the actual conditions encountered during installation.
   2. As-Built drawings will indicate all cable pathways, termination box location(s), and other information related to above-ceiling or concealed equipment locations.
   3. The Contractor will provide drawings showing all changes occurring related to documents provided on the project directly related to this section, and all Security Subsystem Specification sections.
   4. The Contractor will provide scaled drawings of the same formatted size as those originally issued as contract drawings.
   5. Changes will be indicated with referenced graphics that are properly noted:
      a. Clouding will be bold, but without interfering or obscuring documentation information.
      b. Notes will be alphabetically or numerically referenced.
      c. Notations will not interfere with other information on the documents.
   6. Drawings will be completed in a digital format using AutoCAD® Software. Version of files provided to be determined by the Owner’s Representative at the time that submittal of the information is required.

D. The document deviation log will meet the following requirements:
   1. The Contractor will provide a tracking log of changes made to the project that occurred that were in deviation of construction documents, and will include:
      a. Notification date: Provide the day that Owner’s Representative was notified that a deviation was required or requested.
      b. Approval Date: Provide the day that approval was provided by the Owner’s Representative.
      c. Reason that deviation was required or made.
   2. Provide drawings and photographs of all custom details, and details originally in the contract drawings that were modified:
      a. Drawings to be submitted on 8 ½-inch x 11-inch sheets or larger.
      b. Provide photos that are 5-inch x 7-inch in size or larger. Photographs will be clear, focused, and taken with the proper light:
         1) All details will be clearly visible.
         2) All text will be legible.

3.07 ACCEPTANCE

A. System Warranty will not start until Acceptance. Acceptance will be withheld until the following activities have been successfully completed:
   1. Acceptance of all submittals.
   2. Delivery of final documentation.
   3. Successful final test and inspection.
   4. Successful operational demonstration test.
   5. Successful training and demonstration, including operation of systems using manuals.

B. System Contractor will be present at the first use of the facility. The Contractor will be on site the day before the event in addition to the day of the event. The event will be decided by the operators as to which one the systems the Contractor should attend.

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3.08 WARRANTY

A. In addition to all guarantees specified in the Project General Conditions and specific Warranty requirements stated in the Security Subsystem Specifications, furnish the following warranty:

1. Period: The Contractor will guarantee all labor, workmanship, and materials for a period of one (1) year from the date of Final Acceptance. Should system failure occur within the first year, the Contractor will provide all labor and materials necessary to restore the system to the condition required for the final test and acceptance at no cost to the Owner.
2. Tie-ins: During the Warranty period, additional components may be connected to the installed systems. New devices will be connected in the same manner as shown in the Contract Documents and the existence of the new connections will not void this guarantee. Where software is part of the system, new information will be entered into the database to extend the operation of the system.

B. The Contractor shall respond to a request for assistance within four (4) hours of receipt and have the repair completed, or temporality repaired, to the satisfaction of the Owner within 24-hours during the warranty period at no additional cost to the Owner. After-hours service will be available within the four (4) hour window, whether or not the Owner elects to purchase a service contract from the Contractor.

C. The Contractor's guarantee will include all costs related to troubleshooting, repair, and replacement of defective Work, including costs of labor, transportation, materials, equipment, and other costs as necessary to restore the system to a complete and operational state:

1. The Owner must not be without an operational system or component of the system should it require a return to the factory for repair or replacement. It will be the responsibility of the Contractor to replace the component during the 24-hour time period outlined above.

D. The Contractor will provide local service by factory-trained personnel from an authorized Dealer of the equipment manufacturer. The Contractor will provide written proof from the equipment manufacturer which indicates the Contractor is duly authorized to sell, service, and maintain the specified products. The Dealer will have available stock of the manufacturer's standard parts for the primary system components and devices. The Dealer will provide sufficient parts in inventory or readily available such that repair will be completed in no more than 24-hours. The inventory of spare parts requirement is assuming availability of components through a Dealer network and/or obtained from respective manufacturers within the required time frame.

E. The Contractor will offer an "Optional Three (3) Year Maintenance after Warranty" and an "Optional Five (5) Year Maintenance after Warranty" package to the Owner containing price, terms, and conditions shown for each year. The Owner will inform the Contractor of the acceptance or rejection of the package prior to the end of the warranty period.

F. The Contractor will correct any software or firmware defects identified during the Warranty period without additional cost to the Owner.

G. This warranty will be in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.

H. The Contractor will warrant all Work furnished in this project will be of good quality, free from faults and defects, and in conformance with the Contract Documents.

END OF SECTION

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SECTION 28 0513
CONDUCTORS AND CABLES FOR ELECTRONIC SECURITY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including all General and Supplementary Conditions and Division 1 Specification sections, shall apply to this section and shall be considered as forming an integral part of this Work. These documents are referred to as the Project General Conditions in the remainder of these Specifications.

B. The Common Work Results for Electronic Security Specification Section shall apply to Work specified in this Section. Where similar requirements headings are listed herein, they are to augment the requirements indicated within the Common Work Results for Electronic Security Specification Section. Nothing herein shall be construed as relieving Contractor from the requirements identified in the Common Work Results for Electronic Security Specification Section.

C. Not all cables shown within this section will be used on this project.

D. This Specification Section incorporates general requirements for the following security sections:

1. 28 0500 Common Work Results for Electronic Security
2. 28 1000 Access Control

E. Other related sections:

1. Division 07 Firestopping
2. Division 08 Door Hardware
3. Division 26 Electrical
4. Division 27 Structured Cabling and Pathways

1.02 DEFINITIONS

A. AWG: American Wire Gauge

1.03 REFERENCES

A. National Electrical Code (NEC)

B. NFPA 70

C. UL 294 and UL 1076 as required where applicable

D. FCC Rules and Regulations

E. Part 15 Class A or B as applicable

F. Applicable Federal, State, and Local laws, regulations, and other codes

G. CE mark, as and where applicable

H. C-Tick mark, as and where applicable

1.04 SUMMARY OF WORK

A. Work specified in this Section includes cables used for security systems.

1.05 SUBSTITUTION

A. Refer to Section 28 0500 Common Work Results for Electronic Security.

1.06 SUBMITTALS

A. Refer to Section 28 0500 Common Work Results for Electronic Security.

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PART 2 - PRODUCTS

2.01 GENERAL

A. "Or Approved Equal" basis:
   1. The products are listed on an "Or Approved Equal" basis. The known equals to the products specified are listed in each section.
   2. Substitute products not listed in this section may be submitted for approval during the question-and-answer period of the bidding phase. See Action Submittal requirements within 28 0500 Common Work Results for Electronic Security.
   3. Substitution approvals will be based on the complete functionality, integration, operation, and user interface as compared to the specified product(s).
   4. Products not approved prior to the bidding phase will be deemed non-responsive.

B. Pathway shall follow structured cabling Division 27 standards.

C. Provide Wet Rated Cable as required due to project raceways/pathways.

D. All security system cables shall be provided with purple jackets.

2.02 CABLES AND WIRING

A. 18 AWG, 6 Conductor Stranded Overall Shield (Type A)
   1. Provide Windy City Wire 442351-50(Plenum)
   2. Known equals:
      a. Belden
      b. West Penn
   3. Wet Rated Cable
      a. West Penn Wire 2PR485DBBK1000
      b. Or Approved Equal.

B. 18 AWG, 4 Conductor Stranded Unshielded (Type B)
   1. Provide Windy City Wire 0023850-CT (Plenum)
   2. Known equals:
      a. Belden
      b. West Penn
   3. Wet Rated Cable
      a. Windy City Wire 727310VNQ
      b. Or Approved Equal.

C. 18 AWG, 2 Conductor Stranded Unshielded (Type C)
   1. Provide Windy City Wire 1802P-PUR (Plenum)
   2. Known equals:
      a. Belden
      b. West Penn
   3. Wet Rated Cable
      a. Windy City Wire 728110VNQ
      b. Or Approved Equal.

D. 22 AWG, 4 Conductor Stranded Unshielded (Type E)
   1. Provide Windy City Wire 2204P-PUR (Plenum)

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2. Known equals:
    a. Belden
    b. West Penn
3. Wet Rated Cable
    a. Windy City Wire 416310WBT
    b. Or Approved Equal.

E. Composite Access Controlled Door Cable (Type F)
1. Provide Windy City Wire 4461050
2. Known equals:
    a. Belden
    b. West Penn
3. Wet Rated Cable
    a. Windy City Wire 4461111WBT
    b. Or Approved Equal.

F. Network Communication Cable (Type M)
1. Reference section 27 1000 Structured Cabling System.

PART 3 - EXECUTION

3.01 LABELING

A. Provide labeling in accordance with TIA/EIA 606-A Level 2 numbering and ID format.

B. Mechanically print and install in accordance with manufacturer recommendations and drawing details.

C. Labels shall be single line, all capital letters, and bold font. Select font size and color that can be easily read on the applicable device or cable during installation, inspection, and for service maintenance.

D. Ensure all surfaces are clean prior to final placement of labeling products. Follow manufacturer recommendations for cleaning.

E. Handwritten labels are unacceptable.

F. Provide labeling as required for the following:
1. Horizontal and Backbone cabling:
    a. Locate the cable designator within 2-inches of the point of termination at the workstation end of the horizontal cable.
    b. Locate the cable designator within 2-inches of the end of the cable jacket at the ACP end of the horizontal cable.
    c. Junction boxes, pull boxes, HCP’s.
    d. Termination patch panels and blocks.
    e. Grounding and bonding equipment.
    f. Equipment cabinets, racks, frames, and enclosures.
    g. Locate lamacoid labels on the front and rear of equipment cabinets at the top of the cabinet doors. For cabinets equipped with removable doors, one additional pair of labels shall be located on the inside top of the frame.

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G. Provide machine generated labels for each system associated with the Electronic Security System to include, but not limited to, the following:
   1. Conduit pathways including:
      a. Junction boxes
      b. Pull boxes
      c. Horizontal connection points
      d. Conduit
      e. Cable tray
      f. Grounding busbars
      g. Voltage protection equipment

H. Provide machine generated labels for each component associated with the Electronic Security System to include, but not limited to, the following:
   1. Access Control Panels
      a. Label shall include:
         1) Panel name
         2) Location
         3) IP and MAC address
         4) Termination information for each port, input, output, and connection
            a) Panel schedules shall be secured to the interior of the applicable enclosure and be capable of removal for review and updates.
   2. Cameras
   3. Readers
   4. Door Contacts
   5. Termination blocks
   6. Patch panels
   7. Equipment cabinets, racks, frames, and enclosures
   8. Power distribution units, power strips

I. Provide machine generated labels for each cable associated with the Electronic Security System to include, but not limited to, the following:
   1. Copper backbone cables
   2. Fiber optic backbone cables
   3. Horizontal premise cables
   4. Grounding and bonding conductors

J. Provide lamacoid labels for specified equipment.

K. Provide machine generated placards as specified for each technical enclosure.

L. Provide labeling materials designed for a lifetime equal to the system, component or cable being identified.

M. Provide labels on the face of wall mount equipment and on the wall adjacent to the equipment.

3.02 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Refer to Section 28 0500 Common Work Results for Electronic Security.

3.03 SYSTEM TEST AND VERIFICATIONS

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A. Refer to Section 28 0500 Common Work Results for Electronic Security.

3.04 WARRANTY

A. Refer to Section 28 0500 Common Work Results for Electronic Security.

3.05 COORDINATION

A. Coordinate custom ACS report requirements. Submit report templates to the Owner's Representative for review and acceptance.

END OF SECTION

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SECTION 28 1000
ACCESS CONTROL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including all General and Supplementary Conditions and Division 1 Specification sections, shall apply to this section and shall be considered as forming an integral part of this Work. These documents are referred to as the Project General Conditions in the remainder of these Specifications.

B. The Common Work Results for Electronic Security Specification Section shall apply to Work specified in this Section. Where similar requirements headings are listed herein, they are to augment the requirements indicated within the Common Work Results for Electronic Security Specification Section. Nothing herein shall be construed as relieving Contractor from the requirements identified in the Common Work Results for Electronic Security Specification Section.

C. This Specification Section incorporates general requirements for the following security sections:

1. 28 0500 Common Work Results for Electronic Security
2. 28 0513 Conductors and Cables for Electronic Security

D. Other related sections

1. Division 07 Firestopping
2. Division 08 Door Hardware
3. Division 26 Electrical
4. Division 27 Structured Cabling and Pathways

1.02 DEFINITIONS

A. AC: Alternating Current

B. ACS: Access Control System

C. ACP: Access Control Panel

D. ADA: Americans with Disabilities Act

E. API: Application Programming Interface

F. ASCII: American Standard Code for Information Interchange

G. AV: Audio Visual

H. BACnet: Building Automation and Control network

I. BPI: Bits Per Inch

J. BPS: Bits Per Second

K. CCTV: Closed Circuit Television

L. CE: European Conformity

M. CPU: Central Processing Unit

N. DMU: Door Management Unit

O. DVR: Digital Video Recorder

P. FASC-N: Federal Agency Smart Credential Number

Q. FCC: Federal Communications Commission

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R. FDA: Food and Drug Administration
S. FQRN: Fully Qualified Reference Name
T. I/O: Input/output
U. ID: Identification
V. IDP: Intrusion Detection Panel
W. IEC: International Electrotechnical Commission
X. IFC: Intelligent Field Controller
Y. In-X-It: Entry/Exit
Z. ISO: International Organization for Standardization
AA. LDAP: Lightweight Directory Access Protocol
BB. LAHJ: Local Authority Having Jurisdiction
CC. LED: Light Emitting Diode
DD. MIS: Management Information Systems
EE. MSEA: Metasys System Extended Architecture
FF. NEC: National Electrical Code
GG. NEMA: National Electrical Manufacturers Association
HH. NFPA: National Fire Protection Association
II. ODBC: Open Database Connectivity
JJ. OPC: OLE for Process Control
KK. PIAM: Physical Identity Access Management
LL. PIN: Personal Identification Number
MM. PSIM: Physical Security Information Management System
NN. RAM: Random Access Memory
OO. RFQ: Request for Quotation
PP. RPC: Remote Procedure Call
QQ. SDK: Software Development Kit.
RR. SEIWG: Security Equipment Integration Working Group
SS. SIA: Security Industry Association
TT. SMS: Security Management System
UU. SPDT: Single Pole, Double Throw
VV. UDF: User Defined Field
WW. UDP: User Datagram Protocol
XX. UL: Underwriters Laboratories
YY. URL: Uniform Resource Location
ZZ. VSS: Video Surveillance System
AAA. WAMS: Wireless Access Management Solutions
BBB. XML: Extensible Markup Language

1.03 REFERENCES

A. National Electrical Code (NEC)
B. NFPA 70

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C. UL 294 and UL 1076 as required where applicable
D. FCC Rules and Regulations
E. Part 15 Class A or B as applicable
F. Applicable Federal, State, and Local laws, regulations codes, and other standards
G. CE mark, as and where applicable
H. C-Tick mark, as and where applicable

1.04 APPLICABLE CODES AND STANDARDS

A. Work specified herein shall comply with specific provisions of codes and standards adopted by the LAHJ as applies to electric locking devices and controlled egress.
B. Where the LAHJ has adopted a less stringent requirement than those required by the latest version of the International Building Code (IBC) for control of electric locking devices, the latest adopted IBC by the LAHJ shall govern.

1.05 SUMMARY OF WORK

A. This project is to provide a new access control system. The Contractor shall provide new head-end and end-of-line equipment, software integrations, licenses, and necessary programming to provide a fully functional access control system as specified.
B. Work specified in this Section includes systems used for authentication of credential-holders for physical access through associated portals, as well as monitoring of intrusion and other alarm information.
C. The Contractor will provide field access control equipment necessary to provide functional access control system as specified.
D. Credentials may be:
    1. Access cards / readers
E. Systems shall consist of:
    1. Software and associated licensing
    2. Servers
    3. Workstations
    4. Alarm initiation / system ancillary devices
    5. The ACS shall provide the following functions:
        a. Access Control
        b. Alarm Monitoring
        c. Cardholder management
        d. Badge creation
        e. System administration
        f. Badge layout (template) creation
        g. Screen/forms creation
        h. Graphical map creation

1.06 SUBSTITUTION

A. Refer to Section 28 0500 Common Work Results for Electronic Security.

1.07 SUBMITTALS

A. Refer to Section 28 0500 Common Work Results for Electronic Security.

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1.08 RECORD DOCUMENTATION

A. Refer to Section 28 0500 Common Work Results for Electronic Security.

PART 2 - PRODUCTS

2.01 GENERAL

A. Manufacturers

1. All access control hardware and software shall be of a single manufacturer including server system, controllers, workstations, and input and output terminal modules. The system shall have a fully developed integration with the video surveillance, intrusion detection, and intercommunication systems specified on this project.
2. Unless otherwise noted, all materials and equipment shall be new, of the type, capacity, and quality specified and free from defects. Material shall bear the label of, or be listed by, the appropriate local listing agency unless of a type for which label or listing service is not provided.
3. Where multiple items of a similar kind are provided, all shall be identical and of the same manufacturer.
4. The Contract Documents indicate major system components and may not show every component, connector, module, or other accessory that may be required for a complete and operational system. It is the Contractor's responsibility to identify and provide each component necessary for a complete and operational system in accordance with the Contract Documents.

B. Access Control Licenses

1. The Contractor shall provide all necessary licensing, along with a ten-percent contingency for future installs.

C. "Or Approved Equal" basis:

1. The following products listed are on an "Or Approved Equal" basis. The known equals to the products specified are listed in this section.
2. Substitute products not listed in this section may be submitted for approval during the question-and-answer period of the bidding phase. See Action Submittal requirements within 28 0500 Common Work Results for Electronic Security.
3. Substitution approvals will be based on the complete functionality, integration, operation, and user interface as compared to the specified product(s).
4. Products not approved prior to the bidding phase will be deemed non-responsive.

D. Only approved Access Control integrators allowed are:

1. Preferred Technologies
2. Network Cable Solutions
3. Datavox

E. All access control system programming, configuration, commissioning, and database integration shall be performed by Preferred Technologies, regardless of the Contractor responsible for the hardware installation. The access control system installer shall not subcontract the access control hardware installation to another contractor.

2.02 ACCESS CONTROL SYSTEM

A. Shall match the District standard. Provide the latest version of:

1. Genetec Synergis
   a. No Substitutions.

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b. Genetec Synergis certification is required.

B. Access Control Panel (ACP)

1. The access control panel will consist of the power supply and the field panel boards for the specific location:
2. Provide Life Safety Power Enclosure
   a. Enclosure shall be sized to accommodate field panels in quantities to accept all card reader-controlled openings, inputs, and outputs as scheduled in drawings and specifications.
   b. Installing field panels onto enclosure's swing door is not permitted.
   c. Enclosures shall be equipped with hook-and-loop straps and/or Panduit finger duct for cable management.
      1) Basis of Design:
         a) FPO150-B150M8PNLCSD4PE4M/T4-A (4-door)
         b) FPO250-B150M8NLCSD16E6M/P8-A (8-door)
         c) FPO250/250-2M8NLC2SD16E8M2/P16-A (16-door)
      2) LifeSafety Power components shall be compatible with LifeSafety Power NetLink power management. The Contractor shall provide pricing information to Ownership for review during the procurement process.
      3) Or Approved Equal.
   d. Field Panels for Mercury hardware
      1) Intelligent Controller
         a) Provide Mercury hardware (MP1502)
      2) Card Reader Interface Board
         a) Provide Mercury hardware (MR52-S3)
      3) Inputs
         a) Provide Mercury hardware (MR16IN-S3)
      4) Outputs
         a) Provide Mercury hardware (MR16OUT-S3)
   e. Cloud Link
      1) Provide Synergis Cloud Link
      2) Provide sufficient quantities to accommodate project conditions. Installation of Cloud Link devices onto enclosure door swing is permissible.
3. Provide batteries for four (4) hours of operation on loss of power to include lock power.
   a. Power Sonic PS-1270F1
      1) No substitutions.

2.03 CARD READER SYSTEM

A. Card reader system includes the following:

1. Card Reader
   a. Wall and/or mullion mount.
2. Lock specified in Door Hardware.
3. Request-to-Exit switch within door hardware.
4. Request-to-Exit motion detector (if not available within door hardware).

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5. Door Position Switch.

B. Card Reader (CRS)
   1. Provide Schlage Multi-Technology Readers.
      a. MT11 - Mullion Mount
      b. MT15 - Wall Mount

C. Door Position Switch (DC)
   1. Door Position Switches to be provided on openings where integrated lock sets are not utilized.
   2. Provide GRI 199-12WG door contacts.
      a. Switch color shall match door frame color.
   3. Or Approved Equal.

D. Request to Exit Motion Detector
   1. Provide Bosch DS160
      a. Only provide for locations where REX function is not integrated into electrified locking hardware.

E. Remote Door Release (DR)
   1. For door locations equipped with an intercom door station, door release shall be through security intercom master station.
   2. For door locations not equipped with an intercom door station, door release shall be through Voice over Internet Protocol (VoIP) telephone located at the receptionist desk.
      a. Basis of Design:
         1) United Security Products HUB-3B.
      b. Or Approved Equal.
      c. Provide permanent machine produced label for each door controlled, calling out controlled door opening number as it appears in Close-out documents and ACS GUI.

F. Panic Button (PB)
   1. Basis of Design:
      a. Safety and Technology International SS2409EM-EN. (wall mounted)
      b. Contractor to verify panic button part number with Owner prior to procurement.
   2. Design intent is for emergency lockdown of all access control door openings.
   3. Provide permanent machine produced label for each panic button.

G. Above Door Junction Boxes
   1. Provide above door junction boxes with covers and cam locks for the access control system to house the break-out of the combination cable and service loop.
   2. Acceptable product:
      a. Hoffman 8-inch X 8-inch X 6-inch.
      b. Or Approved Equal.

2.04 VIDEO INTERCOM SYSTEM

A. Shall be configured to be viewed and operational with Voice over Internet Protocol (VoIP) telephone located at the receptionist desk.

B. Shall match the District standard: Hanwha Vision

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1. Video Intercom (VIC)
    a. Provide Hanwha Vision TID-600R
        1) Provide Hanwha Vision SBS-165TM tilt mount if not mounted directly to door.
    b. No substitutions.
2. Master Video Intercom (MVI)
    a. Provide Grandstream GXV3450
    b. No substitutions.
3. IP Ceiling Speaker (CS)
    a. Provide Hanwha SPA-C110W
    b. Device shall integrate with the Video Intercom System to provide audible annunciation upon activation.

C. Door Release
1. Access Control doors equipped with Video Intercom System (VIC) shall be configured for door release via the VoIP enabled phone located at the receptionist desk.
2. Provide any, and all, necessary hardware at each access control panel in quantities sufficient to release controlled openings equipped with a Video Intercom Door Station.

D. Systems Integration
1. The system will be integrated with the ACS system to provide remote door release functions as noted.
2. Intercom video cameras shall be integrated into the VMS for recording and retaining video images.

2.05 CREDENTIALS

A. Contractor shall provide new Allegion DESFire credentials. Coordinate with Owner for preferred model numbers. Card count shall be based on campus staff numbers plus ten percent. Contractor shall verify with Owner for facility code and card number range.

2.06 CABLES AND WIRING

A. Refer to Section 28 0513 Conductors and Cables for Electronic Security.

B. Pathways shall follow Structured Cabling Division 27.

2.07 TECHNICAL REQUIREMENTS

A. Server Hardware
1. The design intent is to expand the Owner’s existing access control server. Contractor shall include cost to provide additional software licensing as required to meet specifications.

B. Client Workstation (WS)
1. Owner Furnished and Owner Installed.
2. The Contractor shall provide the access control workstation client software and system programming to accommodate command and control from computer workstations as directed by Owner.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Ensure all relevant doors and door frames are properly prepared for electric locking hardware and door position switches.

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B. Verify acceptance of each type of specified request-to-exit hardware for each application with the LAHJ.

C. Verify fail-safe and fail-secure lock requirements with the LAHJ.

3.02 INSTALLATION

A. ACP

1. Wiring within the ACP panels shall not have more than one-fourth inch (0.25”) of exposed copper outside of the terminal.
2. High voltage (120 VAC) shall be separate from low voltage wiring within the panel.
3. Install the ACP in a readily accessible location as defined in Article 100 of the NEC 2014.
4. Connect field wiring to boards within the ACP in accordance with manufactures recommendations.
5. Provide machine generated panel schedules within all access control panels and power supplies.

B. End-of-Line Supervision

1. Selected field wiring shall be supervised. Cutting, shorting, or altering connections of any wire, listed as supervised below, shall be detected, and activate an alarm condition at Client Workstations. Provide wiring supervision for the following functions:
   a. Door position switches
   b. Request-to-exit devices
   c. Perimeter intrusion detection devices
   d. Any other device which reports a digital (on/off) condition back to the system ACP
2. End-of-Line supervision shall detect and annunciate four (4) states. Electrical open and short conditions shall not annunciate as any other condition than trouble or fault within the ACS software.

C. All access control system enclosures shall be provided with tamper switches and keyed cam-locks.

D. Machine generated labels with panel schedules shall be included in all security enclosures. Schedules shall include all port/input/output/spare information to match system programming.

E. Multiple Contractor user privilege levels will likely be established during the installation and testing periods of this Project. As a condition of system final acceptance, all Contractor user privileges shall be removed from the system, unless otherwise authorized in writing, by the Owner. Prior to removal of Contractor access privileges, the Contractor shall ensure that the Owner has been set up with a master password.

F. Configure the ACS such that devices can be connected to spare input points, output points, and card reader inputs on the IFC without requiring reconfiguration of the ACS.

G. Card Readers: Wire card reader LEDs to indicate valid and invalid card reads and door locked and unlocked conditions. All card reader LED indicators shall operate identically throughout the Project. The LED shall be red in the normal, secured state, and shall be green on valid card read and while the door is unlocked.

H. Electric Locking Mechanisms

1. Interface with electric locking mechanisms provided under a separate Door Hardware Section.
2. Connections shall be wired fail-secure except for those electric locking mechanisms the LAHJ has deemed necessary to fail-safe. The Contractor shall coordinate with Door Hardware to determine which doors are fail-safe.

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I. Auto-Door Interface
   1. Interface to auto-door/auto-assist operators to permit door unlock and activation upon presentation of a valid access control credential.
   2. Coordinate with Division 08 and Division 26 for all conduits and power requirements.
   3. Provide relay modules as required.

J. Fire Alarm Interface
   1. Activation of any fire alarm initiating device programmed to trigger building evacuation, including but not limited to manual pull stations, smoke detectors, duct detectors, waterflow switches, or general alarm conditions, shall immediately release all designated locking devices in accordance with applicable codes, regulations, and the LAHJ.
   2. The ACS shall receive fire alarm release signals from the FACP through a single low voltage/low current, normally closed, dry contact provided by the Fire Alarm Contractor. Coordinate exact locations.
   3. Fire alarm release signals shall override all access control functions, schedules, lockdown modes, and card access permissions. Openings shall remain in the required life-safety condition until the fire alarm condition has been cleared and the fire alarm system has been reset, unless otherwise required by local Codes.
   4. Connection of fail-safe relays and power supplies shall be to standard building power. Connection of fail-safe devices to emergency or UPS power is not permitted.

K. Coordinate the interface to Emergency Power for all security head-end components, including those specified in other Security Subsystem Specifications.

L. Install signal in conduit provided as shown on the Electrical drawings and drawings within this section. If additional conduit/raceway/tray is required for systems, provide.

M. Conduit/raceway/tray/wire management not shown on these drawings, but required for a complete system or by code, is to be included in this scope of work. Any cabling exposed to public view is to be in conduit. Any exterior junction boxes, conduit/raceway, terminations, etc. at, and those within, enclosures where enclosures are exposed to outdoor conditions are to meet NEMA ratings for outdoor electrical applications.

3.03 PROGRAMMING

A. 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, the 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 Owner, any additional data needed to make the Security System fully operational and integrated. Provide the completed forms to the Owner for review and approval at least thirty (30) days prior to the Contractor's scheduled need date.

B. Programming and setup data shall include, at a minimum, the following:
   1. Graphical maps and icons:
      a. Coordinate with the Owner’s Representative to obtain AutoCAD architectural backgrounds for implementation as graphical maps. Import all AutoCAD background information provided by the Owner’s Representative and produce a complete set of graphical maps depicting all ACS points.
      b. Partition and segregate graphical map displays between “Base Building” and “Tenant” as specified herein.
   2. ACS card reader information:

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a. Coordinate all card reader values and text, including descriptors, alarm messages, VSS camera call up, map call up, and identification with the Owner's Representative.

b. Certain card readers shall be designated for handicap access only. Coordinate special access privileges with the Owner's Representative and program the ACS accordingly.

3. Input and output points for the ACS. Coordinate all input and output priorities and text, including descriptors, alarm messages, VMS Camera call up, map call up, and identification with the Owner's Representative.

4. Initial system users, including levels of access. This shall include the designation of an Owner's Representative at the "Super User" level immediately upon ACS initialization.

5. Initial VMS camera call-up and alarm information for interface with VMS system.

6. Alarm monitoring and automatic shutdown information for the UPS interface.

3.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Refer to Section 28 0500 Common Work Results for Electronic Security.

3.05 LABELING OF EQUIPMENT

A. Refer to Section 28 0500 Common Work Results for Electronic Security.

3.06 SYSTEM TEST AND VERIFICATIONS

A. Refer to Section 28 0500 Common Work Results for Electronic Security.

3.07 WARRANTY

A. Refer to Section 28 0500 Common Work Results for Electronic Security.

3.08 COORDINATION

A. Coordinate cylinder and master key requirements for LAAs and bypass key switches.

B. Coordinate custom ACS report requirements. Submit report templates to the Owner's Representative for review and acceptance.

C. Coordinate initial database partitioning and setup with the Owner prior to initial programming and cardholder data entry.

D. Coordinate door hardware for ACS doors to ensure the ACS will function properly.

E. Coordinate IP addressing of all system components.

3.09 PREPARATION FOR SITE OBSERVATION

A. Prior to requesting final site observation of the ACS system, the Contractor will submit test sheets for each ACS portal confirming final testing and commissioning has been completed.

1. Minimum data needed for the test sheets.

a. Project Name

b. Equipment Type

c. Equipment location

d. All components are tested

e. Wiring installed in conduit or raceway

f. Grounds installed as specified and tested

g. Equipment connections properly torqued

h. Batteries installed in control cabinets

i. Card Readers tested

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j. Control cabinet wiring has been dressed
k. Equipment labeled
l. Control Panel programmed
m. Access database programing complete
n. Interface to elevator or fire system tested and complete
o. Network functional to allow head end connection
p. IP address
q. Subnet Mask
r. Controller
s. Sub Controller (if used)
t. Board
u. Point
v. Testing card results for:
    1) Valid
    2) Invalid by name
    3) Invalid by permission
    4) Invalid by no programming
    5) Valid per floor
w. DC Voltage at Card Reader
x. Ohm Reading of device wiring from control panel (with resistor at EOL)
y. Card Reader within 300’ of nearest control panel
z. Document the system schedule the card reader is assigned

END OF SECTION

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SECTION 28 4600
FIRE DETECTION AND ALARM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire alarm system design and installation, including all components, wiring, and conduit.

B. Transmitters for communication with supervising station.

C. Maintenance of fire alarm system under contract for specified warranty period.

1.02 RELATED REQUIREMENTS

A. Section 08 3323 - Overhead Coiling Doors: Coiling fire doors to be released by fire alarm system.

B. Section 08 7100 - Door Hardware: Electrically operated locks and door holder devices to be monitored and released by fire alarm system.

C. Section 21 1300 - Fire-Suppression Sprinkler Systems: Supervisory, alarm, and actuating devices installed in sprinkler system.

D. Section 21 2200 - Clean-Agent Fire-Extinguishing System: Supervisory, alarm, and releasing devices installed in extinguishing system.

E. Section 23 3300 - Air Duct Accessories: Smoke dampers monitored and controlled by fire alarm system.

1.03 REFERENCE STANDARDS

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. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. NFPA 72 - National Fire Alarm and Signaling Code; Most Recent Edition Cited by Referring Code or Reference Standard.

F. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Proposal Documents: Submit the following with cost/time proposal:
   1. NFPA 72 "Record of Completion", filled out to the extent known at the time.
   2. Manufacturer's detailed data sheet for each control unit, initiating device, and notification appliance.
   3. Certification by Contractor that the system design will comply with Contract Documents.
   4. Proposed maintenance contract.

C. Evidence of designer qualifications.

D. Design Documents: Submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, riser diagrams, and description of operation:
   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. 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.
4. System zone boundaries and interfaces to fire safety systems.
5. Location of all components, circuits, and raceways; mark components with identifiers used in control unit programming.
6. Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; spare capacity calculations; notification appliance circuit voltage drop calculations.
7. List of all devices on each signaling line circuit, with spare capacity indicated.
8. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.
9. Description of power supplies; if secondary power is by battery include calculations demonstrating adequate battery power.
10. Detailed drawing of graphic annunciator(s).
11. Certification by either the manufacturer of the control unit or by the manufacturer of each other component that the components are compatible with the control unit.
12. Certification by the manufacturer of the control unit that the system design complies with Contract Documents.
13. Certification by Contractor that the system design complies with Contract Documents.

E. Evidence of installer qualifications.

F. Evidence of instructor qualifications; training lesson plan outline.

G. Evidence of maintenance contractor qualifications, if different from installer.

H. 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.

I. Operating and Maintenance Data: See Section 01 7800 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.

J. Project Record Documents: See Section 01 7800 for additional requirements; 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.

K. 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. Certificate of Occupancy.
   4. Maintenance contract.
   5. Report on training results.

L. 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.

1.05 QUALITY ASSURANCE

A. Designer Qualifications: NICET Level III or IV (3 or 4) certified fire alarm technician or registered fire protection engineer, employed by fire alarm control panel manufacturer, Contractor, or installer , with experience designing fire alarm systems in the jurisdictional area of the authorities having jurisdiction.

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.
   4. Certified in the State in which the Project is located as fire alarm installer.

C. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.

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.

1.06 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

2.01 MANUFACTURERS

A. Fire Alarm Control Units and Accessories:
   1. Honeywell Security & Fire Solutions/Notifier: www.notifier.com/#sle.
   2. Edwards EST4 system - District preferred.
   3. Provide equipment and devices compatible with existing system.

B. Initiating Devices and Notification Appliances:
   1. Same manufacturer as control units.

2. Provide initiating devices and notification appliances made by the same manufacturer, where possible.

C. Refer to division 27 for low voltage cabling color coding and related requirements.

2.02 FIRE ALARM SYSTEM

A. Fire Alarm System: Provide a new automatic fire detection and alarm system:
1. Existing Fire alarm panel and devices may be re-used as determined by the fire alarm designer to bring the existing fire alarm system serving the existing portion of the building up to current code requirements.
a. Provide alternate pricing for replacement of existing fire alarm panels to be upgraded with new fire alarm panels.
2. Provide all components necessary, regardless of whether shown in Contract Documents or not.
3. Protected Premises: Entire building shown on drawings.
4. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
a. ADA Standards.
b. The requirements of the State Fire Marshal.
c. The requirements of the local authority having jurisdiction .
d. Applicable local codes.
e. Contract Documents (drawings and specifications).
f. NFPA 101.
g. 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.
5. Evacuation Alarm: Multiple smoke zones; allow for evacuation notification of any individual zone or combination of zones, in addition to general evacuation of entire premises.
6. Voice Notification: Provide emergency voice/alarm communications with multichannel capability; digital.
7. General Evacuation Zones: Each smoke zone is considered a general evacuation zone unless otherwise indicated, with alarm notification in all zones on the same floor, on the floor above, and the floor below.
8. Program notification zones and voice messages as directed by Owner.
9. Fire Command Center: Location indicated on drawings.
10. Fire Alarm Control Unit: New, located at fire command center.
11. Two-Way Telephone: Provide two-way telephone service for the use of the fire service and others; provide jacks and two portable handsets.
12. Combined Systems: Do not combine fire alarm system with other non-fire systems.

B. Supervising Stations and Fire Department Connections:
1. Public Fire Department Notification: By on-premises supervising station.
2. On-Premises Supervising Station: New proprietary station operated by Owner, located at _____.
3. Means of Transmission to On-Premises Supervising Station: Directly connected noncoded system.
4. Means of Transmission to Remote Supervising Station: Digital alarm communicator transmitter (DACT), 2 telephone lines.

C. Circuits:
1. Initiating Device Circuits (IDC): Class B, Style A.
2. Signaling Line Circuits (SLC) Within Single Building: Class B, Style 0.5.

3. Notification Appliance Circuits (NAC): Class B, Style W.

D. Spare Capacity:
1. Initiating Device Circuits: Minimum 25 percent spare capacity.
2. Notification Appliance Circuits: Minimum 25 percent spare capacity.
3. Speaker Amplifiers: Minimum 25 percent spare capacity.
4. 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 power distribution system.
2. Secondary: Storage batteries.
3. Capacity: Sufficient to operate entire system for period specified by NFPA 72.
4. Each Computer System: Provide uninterruptible power supply (UPS).

2.03 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. Total flooding suppression system activation.
3. Kitchen hood suppression activation; also disconnect fuel source from cooking equipment.
4. Elevator lobby, elevator hoistway, and elevator machine room smoke detectors.
5. Duct 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 indicated.

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 7100.
2. Electromagnetic Door Locks on Egress Doors: Unlock upon activation of any alarm initiating device or suppression system in smoke zone that doors serve as egress from. Refer to Section 08 7100.
3. 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 3323.

2.04 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: Analog, addressable type; listed, classified, and labeled as suitable for the purpose intended.

C. in addition to code required components, provide carbon monoxide detectors in all classrooms. Detectors shall be located in HVAC ductwork.

D. Provide wire guards for devices installed in gyms.

E. Master Control Unit: FACP.

F. Remote Annunciators: FAP.

G. 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. Control Modules: Provide as indicated or as required for selective control of notification appliances.
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.

H. 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.

I. Notification Appliances:
1. Bells: _____.
   a. Provide 1 extra.
2. Speakers: _____.
   a. Provide 1 extra.
3. Strobes: _____.
   a. Provide 1 extra.

J. Circuit Conductors: Copper or optical fiber; provide 200 feet extra; color code and label.

K. Surge Protection: In accordance with IEEE C62.41.2 category B combination waveform and NFPA 70; except for optical fiber conductors.
1. Equipment Connected to Alternating Current Circuits: Maximum let through voltage of 350 V(ac), line-to-neutral, and 350 V(ac), line-to-line; do not use fuses.
2. 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.
1. Provide the same standard lock and key for each key operated switch and lockable panel and cabinet; provide 5 keys of each type

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 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.

N. Storage Cabinet for Spare Parts and Tools: Steel with baked enamel finish, size appropriate to quantity of parts and tools.
   1. Padlock eye and hasp for lock furnished by Owner.
   2. Locate as directed by Owner.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with applicable codes, NFPA 72, NFPA 70, and Contract Documents.

B. Conceal all wiring, conduit, boxes, and supports where installed in finished areas.

C. Obtain Owner's approval of locations of devices, before installation.

D. Install instruction cards and labels.

3.02 INSPECTION AND TESTING FOR COMPLETION

A. Notify Owner 7 days prior to beginning completion inspections and tests.

B. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

C. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.

D. Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required.

E. Provide all tools, software, and supplies required to accomplish inspection and testing.

F. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.

G. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

H. Diagnostic Period: After successful completion of inspections and tests, Operate system in normal mode for at least 14 days without any system or equipment malfunctions.
   1. Record all system operations and malfunctions.
   2. If a malfunction occurs, start diagnostic period over after correction of malfunction.
   3. Owner will provide attendant operator personnel during diagnostic period; schedule training to allow Owner personnel to perform normal duties.
   4. At end of successful diagnostic period, fill out and submit NFPA 72 "Inspection and Testing Form."

3.03 OWNER PERSONNEL INSTRUCTION

A. Provide the following instruction to designated Owner personnel:
   1. Hands-On Instruction: On-site, using operational system.
   2. Classroom Instruction: Owner furnished classroom, on-site or at other local facility.
   3. Factory Instruction: At control unit manufacturer's training facility.

B. Administrative: One-hour session(s) covering issues necessary for non-technical administrative staff; classroom:

1. Initial Training: 1 session pre-closeout.

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 pre-closeout.

D. Detailed Operation: Two-hour sessions for engineering staff; assume NICET level I qualifications or equivalent; combination of classroom and hands-on:
   1. Initial Training: 1 session pre-closeout.

E. Maintenance Technicians: Detailed training for electrical technicians, on programming, maintaining, repairing, and modifying; factory training:
   1. Initial Training: One 3-day session, pre-closeout.

F. Furnish the services of instructors and teaching aids; have copies of operation and maintenance data available during instruction.

G. Provide means of evaluation of trainees suitable to type of training given; report results to Owner.

3.04 CLOSEOUT

A. Closeout Demonstration: Demonstrate proper operation of all functions to Owner.
   1. Be prepared to conduct any of the required tests.
   2. Have at least one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.
   3. Have authorized technical representative of control unit manufacturer present during demonstration.
   4. Demonstration may be combined with inspection and testing required by authority having jurisdiction; notify authority having jurisdiction in time to schedule demonstration.
   5. Repeat demonstration until successful.

B. Occupancy of the project will not occur prior to Substantial Completion.

C. Substantial Completion of the project cannot be achieved until inspection and testing is successful and:
   1. Specified diagnostic period without malfunction has been completed.
   2. Approved operating and maintenance data has been delivered.
   3. Spare parts, extra materials, and tools have been delivered.
   4. All aspects of operation have been demonstrated to Owner.
   5. Final acceptance of the fire alarm system has been given by authorities having jurisdiction.
   6. Occupancy permit has been granted.
   7. Specified pre-closeout instruction is complete.

D. Perform post-occupancy instruction within 3 months after Substantial Completion.

3.05 MAINTENANCE

A. See Section 01 7000 - 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.

END OF SECTION

SECTION 31 2310
BUILDING EXCAVATION AND FILL

PART 1 – GENERAL

1.01 DESCRIPTION

A. Work included: Excavate, backfill, compact, and grade for the building to the elevations shown on the Drawings, as specified herein, and as needed to meet the requirements of the construction shown in the Contract Documents.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. Section 00 3132 – Geotechnical Data.
   3. Section 01 4000 – Quality Requirements.

1.02 QUALITY ASSURANCE

A. Contractor shall ensure all bid and proposal documents and contracts include, if applicable to their trade, all required information related to trench excavation and working safety in compliance with Texas Health and Safety Code 756.021.

B. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

C. Use equipment adequate in size, capacity, and numbers to accomplish the work of this Section in a timely manner.

D. In addition to complying with requirements of governmental agencies have jurisdiction, comply with the directions of the Geotechnical Engineer.

1.03 PRODUCT HANDLING

A. Comply with pertinent provisions of Supplementary Conditions.

PART 2 – PRODUCTS

2.01 SOIL MATERIALS

A. Provide fill as indicated on the Drawing Sheets prepared by the various design professionals on the project.

PART 3 – EXECUTION

3.01 SURFACE CONDITIONS

A. Examine the area and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 FINISH ELEVATIONS AND LINES

A. Finish grades shall be as shown on the site plan and shall form straight lines of slope between elevation markings.

3.03 PROCEDURES

A. Utilities:
   1. Unless shown to be removed, protect active utility lines shown on the Drawings or other wise made known to the Contractor prior to excavating. If damaged, repair or replace at no additional cost to the Owner.
   2. If active utility lines are encountered, and are not shown on the Drawings or otherwise made known to the Contractor, promptly take necessary steps to assure that service is not interrupted.

3. If service is interrupted as a result of work under this Section, immediately restore service by repairing the damaged utility at no additional cost to the Owner.
4. If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify the Architect and secure his instructions.
5. Do not proceed with permanent relocation of utilities until written instructions are received from the Architect.

B. Protection of persons and property:
1. Barricade open holes and depressions occurring as part of the Work, and post warning lights on property adjacent to or with public access.
2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.
3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout, and other hazards created by operations under this Section.

C. De-watering:
1. Remove all water, including rain water, encountered during trench and sub-structure work to an approved location by pumps, drains, and other approved methods.
2. Keep excavations and site construction area free from water.
3. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.

D. Maintain access to adjacent areas at all times.

3.04 EXCAVATING

A. Perform excavating of every type of material encountered within the limits of the Work to the lines, grades, and elevations indicated and specified herein.

B. Surplus material:
1. Dispose of unsatisfactory excavated material, and surplus satisfactory excavated material, away from the Project site.

C. Unauthorized excavation:
1. Unauthorized excavation consists of removal of materials beyond indicated sub-grade elevations or dimensions without specific instruction from the Architect or the Geotechnical Engineer.
2. Under footings, foundations, or retaining walls:
a. Fill unauthorized excavations by extending the indicated bottom elevation of the footing or base to the excavation bottom, without altering the required top elevation.
b. When acceptable to the Geotechnical Engineer, lean concrete fill may be used to bring the bottom elevation to proper position.
3. Elsewhere, backfill and compact unauthorized excavations as specified for authorized excavations, unless otherwise directed by the Geotechnical Engineer.

D. Stability of excavations:
1. Slope sides in accordance with OSHA requirements. For proposal purposes, proposers shall assume 1.5H:1V maximum slope. Steeper slopes are permitted only when allowed by OSHA or the Geotechnical Engineer. Calculations and drawings sealed by an Engineer licensed in the State of Texas, shall be submitted to the Architect and Engineer for design of any alternative excavation protection systems.
2. Shore and brace where sloping is not possible because of space restrictions or stability of the materials being excavated.
3. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.

E. Shoring and bracing:

1. Provide materials for shoring and bracing as may be necessary for safety of personnel, protection of work, and compliance with requirements of governmental agencies having jurisdiction.
2. Maintain shoring and bracing in excavations regardless of the time period excavations will be open.
3. Carry shoring and bracing down as excavation progresses.

F. Excavating for structures:
1. Conform to elevations and dimensions shown within a tolerance of 0.10 ft., and extending a sufficient distance from footings and foundations to permit placing and removing concrete formwork, installation of services, other construction required, and for inspection.
2. In excavating for footings and foundations, take care not to disturb bottom of excavation:
a. Excavate by hand tools to final grade just before concrete is placed.
b. Trim bottoms to required lines and grades to leave solid base to receive concrete.
c. Where continuous or spot footings are shown to be bearing on the soil, compact the bottom of the footing as noted in Paragraph 3.06 of this Section. Trenches and foundation holes shall be dry and free of water when concrete is placed.
3. Excavate for footings and foundations only after general site excavating, filling, and grading are complete.

3.05 FILLING AND BACKFILLING

A. General:
1. For each classification listed below, place acceptable soil material in layers to required sub-grade elevations. Provide fill and backfill as indicated on the Drawing Sheets prepared by the various design professionals on the project.

B. Backfill excavations as promptly as progress of the Work permits, but not until completion of the following.
1. Acceptance of construction below finish grade including, where applicable, dampproofing and waterproofing.
2. Inspecting, testing, approving, and recording locations of underground utilities.
3. Removing concrete formwork.
4. Removing shoring and bracing, and backfilling of voids with satisfactory materials.
5. Removing trash and debris.
6. Placement of horizontal bracing on horizontally supported walls.

C. Placing and compacting:
1. Place backfill and fill materials in layers not more than 8" in loose depth.
2. Before compacting, moisten or aerate each layer as necessary to provide the optimum moisture content.
3. Compact each layer to required percentage of maximum density for area.
4. Do not place backfill or fill material on surfaces that are muddy, frozen, or containing frost or ice.
5. Place backfill and fill materials evenly adjacent to structures, to required elevations.
6. Take care to prevent wedging action of backfill against structures by carrying the material uniformly around the structure to approximately the same elevation in each lift.
7. Where the construction includes basement or other underground walls having structural floors over them, do not backfill such walls until the structural floors are in place and have attained sufficient strength to support the walls.

3.06 COMPACTING

A. Compact the soil within the building lines as indicated in the Structural drawings and the geotechnical report. If there are any discrepancies, the Contractor shall compact to the most stringent case of these.

B. Control soil compaction during construction outside building lines to provide the minimum percentage of density specified for each area as determined according to ASTM D698 Standard Proctor Density.

3.07 FIELD QUALITY CONTROL

A. An Special Inspection and Testing Agency (SITA) will perform field quality control tests and inspections, as specified in Section 01 4533.

3.08 MAINTENANCE

A. Protect newly graded areas.

B. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, reshape, and compact to the required density prior to further construction.

PART 4 – TRENCHING REQUIREMENTS

4.01 GENERAL

A. These requirements shall be used for all trench excavations deeper than five (5) feet. The excavating and trenching operation manual of OSHA, Subpart B (latest edition) shall be the minimum governing requirement of this item and is hereby made a part of this specification.
   1. Banks more than 5 feet high shall be shored, laid back to a stable slope, or some other equivalent means of protection shall be provided where employees may be exposed to moving ground or cave-ins. Refer to Table P-1 as a guide sloping of banks. Trenches less than 5 feet in depth shall also be effectively protected when examination of the ground indicates hazardous ground movement may be expected.
   2. Sides of trenches in unstable or soft material, 5 feet or more in depth, shall be shored, sheeted, braced, sloped, or otherwise supported by means of sufficient strength to protect the employees working within them. See Table P-1, P-2 (following paragraph (l) of this section.)
   3. Sides of trenches in hard or compact soil, including embankments, shall be shored or otherwise supported when the trench is more than 5 feet in depth and 8 feet or more in length. In lieu of shoring, the sides of the trench above the 5-foot level may be sloped to preclude collapse, but shall not be steeper than a 1-foot rise to each 1/2-foot horizontal. When the outside diameter of a pipe is greater than 6 feet, a bench of 4-foot minimum shall be provided at the toe of the sloped portion.
   4. Materials used for sheeting and sheet piling, bracing, shoring, and underpinning, shall be in good serviceable condition, and timbers used shall be sound and free from large or loose knots, and shall be designed and installed so as to be effective to the bottom of the excavation.
   5. Additional precautions by way of shoring and bracing shall be taken to prevent slides or cave-ins when excavations or trenches are made in locations adjacent to backfilled excavations, or where excavations are subjected to vibrations from railroad or highway traffic, the operation of machinery, or any other source.
   6. Employees entering bell-bottom pier holes shall be protected by the installation of a removable-type casing of sufficient strength to resist shifting of the surrounding earth. Such temporary protection shall be provided for the full depth of that part of each pier hole which is above the bell. A lifeline, suitable for instant rescue and securely fastened to a shoulder harness, shall be worn by each employee entering the shafts. This lifeline shall be individually manned and separate from any line used to remove materials excavated from the bell footing.
   7. Minimum requirements for trench timbering shall be in accordance with Table P-2.
   8. Braces and diagonal shores in a wood shoring system shall not be subjected to compressive stress in excess of values given by the following formula:
      a. S=3-20L/D

b. Maximum ratio L/D=50
c. Where: L= Length, unsupported, in inches.
d. D= Least side of the timber in inches.
e. S= Allowable stress in pounds per square inch of cross-section.

9. When employees are required to be in trenches 4 feet deep or more, an adequate means of exit, such as a ladder or steps shall be provided and located so as to require no more than 25 feet of lateral travel.
10. Bracing or shoring of trenches shall be carried along with the excavation.
11. Cross braces or trench jacks shall be placed in true horizontal position, be spaced vertically, and be secured to prevent sliding, falling, or kickouts.
12. Portable trench boxes or sliding trench shields may be used for the protection of personnel in lieu of a shoring system or sloping. Where such trench boxes or shields are used, they shall be designed, constructed, and maintained in a manner which will provide protection equal to or greater than the sheeting or shoring required for the trench.
13. Backfilling and removal of trench supports shall progress together from the bottom of the trench.
14. Jacks or braces shall be released slowly and, in unstable soil, ropes shall be used to pull out the jacks or braces from above after employees have cleared the trench.

B. Definitions applicable to this subpart:
1. "Accepted engineering requirements (or practices)" - Those requirements or practices which are compatible with standards required by a registered architect, a registered professional engineer, or other duly licensed or recognized authority.
2. "Angle of repose" - The greatest angle above the horizontal plane at which a material will lie without sliding.
3. "Bank" - A mass of soil rising above a digging level.
4. "Belled excavation" - A part of a shaft or footing excavation, usually near the bottom and bell-shaped; i.e., an enlargement of the cross section above.
5. "Braces (trench)" - The horizontal members of the shoring system whose ends bear against the uprights or stringers.
6. "Excavation" - Any manmade cavity or depression in the earth's surface, including its sides, walls, or faces, formed by earth removal and producing unsupported earth conditions by reasons of the excavation. If installed forms or similar structures reduce the depth-to-width relationship, an excavation may become a trench.
7. "Faces" - See paragraph (k) of this section.
8. "Hard compact soil" - All earth materials not classified as running or unstable.
9. "Kickouts" - Accidental release or failure of a shore or brace.
10. "Sheet pile" - A pile, or sheeting, that may form one of a continuous interlocking line, or a row of timber, concrete, or steel piles, driven in close contact to provide a tight wall to resist the lateral pressure of water, adjacent earth, or other materials.
11. "Sides", "Walls", or "Faces" - The vertical or inclined earth surfaces formed as a result of excavation work.
12. "Slope" - The angle with the horizontal at which a particular earth material will stand indefinitely without movement.
13. "Stringers" (wales) - The horizontal members of a shoring system whose sides bear against the uprights or earth.
14. "Trench" - A narrow excavation made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench is not greater than 15 feet.
15. "Trench jack" - Screw or hydraulic type jacks used as cross bracing in a trench shoring system.
16. "Trench shield" - A shoring system composed of steel plates and bracing, welded or bolted together, which support the walls of a trench from the ground level to the trench bottom and which can be moved along as work progresses.

17. "Unstable soil" - Earth material, other than running, that because of its nature or the influence of related conditions, cannot be depended upon to remain in place without extra support, such as would be furnished by a system of shoring.
18. "Uprights" - The vertical members of a shoring system.
19. "Wales" - See paragraph (m) of this section.
20. "Walls" - See paragraph (k) of this section.

END OF SECTION

SECTION 31 3116
TERMITE CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Chemical soil treatment.

1.02 REFERENCE STANDARDS

A. Title 7, United States Code, 136 through 136y - Federal Insecticide, Fungicide and Rodenticide Act; 2022.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Indicate toxicants to be used, composition by percentage, dilution schedule, intended application rate.

C. Test Reports: Indicate regulatory agency approval reports when required.

D. Manufacturer's Certificate: Certify that toxicants meet or exceed specified requirements.

E. Certificate of compliance from authority having jurisdiction indicating approval of toxicants.

F. Manufacturer's Application Instructions: Indicate caution requirements and materials list of proposed items to be provided under this section.

G. Record and document moisture content of soil before application, date and rate of application, areas of application, and diary of toxicity meter readings and corresponding soil coverage.

H. Installer Qualifications: Company specializing in performing work of the type specified and with minimum 5 years years of documented experience.

I. Maintenance Data: Indicate re-treatment schedule .

J. Warranty: Submit warranty and ensure that forms have been completed in Owner's name.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing this type of work and:
   1. Having minimum of 5 years documented experience.
   2. Approved by manufacturer of treatment materials.
   3. Licensed in Texas.

1.05 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year installer's warranty against damage to building caused by termites.
   1. Include coverage for repairs to building and to contents damaged due to building damage. Repair damage and, if required, re-treat.
   2. Inspect annually and report in writing to Owner. Provide inspection service for 5 years from Date of Substantial Completion.
   3. Make inspections, retreatment, and repairs at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 CHEMICAL SOIL TREATMENT

A. Installer shall notify the Texas Department of Agriculture no more than 24 hours before application and provide all data and pre-treatment paperwork to the Owner for review.

B. Toxicant Chemical: EPA Title 7, United States Code, 136 through 136y approved; synthetically color dyed to permit visual identification of treated soil.

C. Diluent: Recommended by toxicant manufacturer.

D. Manufacturers:
   1. Bayer Environmental Science Corp: www.backedbybayer.com/pest-management.
   2. Control Solutions, Inc.; Taurus SC: www.controlsolutionsinc.com.
   3. FMC Professional Solutions: www.fmcprosolutions.com.
   4. Syngenta Professional Products: www.syngentaprofessionalproducts.com.
   5. Termiticide/Termidor HE or SE by Termidor Termite Defense: www.termidorhome.com
   6. Substitutions: See Section 01 6000 - Product Requirements.

E. Mixes: Mix toxicant to manufacturer's instructions.

F. If combinations of toxicants are approved by governmental agencies having jurisdiction, provide toxicants having such approval and in the maximum strength so approved, at no additional cost to the Owner.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that soil surfaces are unfrozen, sufficiently dry to absorb toxicant, and ready to receive treatment.

B. Verify final grading is complete.

3.02 APPLICATION - CHEMICAL TREATMENT

A. Comply with requirements of U.S. EPA and applicable state and local codes.

B. Spray apply toxicant in accordance with manufacturer's instructions.

C. Apply toxicant at following locations:
   1. Under Slabs-on-Grade.
   2. In Crawl Spaces.
   3. At Interior Side of Foundation Surface.
   4. Utility Entrances
   5. Immediately below expansion joints, control joints, and all areas where slab will be penetrated by construction features.
   6. Where exterior facings or veneers extend below grade level along the exterior side of all foundation walls.
   7. Where unit masonry foundation construction is used.

D. Under slabs, apply toxicant immediately prior to installation of vapor barrier or void forms.

E. At foundation walls, apply toxicant immediately prior to finish grading work outside foundations.

F. Apply extra treatment to structure penetration surfaces such as pipe or ducts, and soil penetrations such as grounding rods or posts.

G. Re-treat disturbed treated soil with same toxicant as original treatment.

H. If inspection or testing identifies the presence of termites, re-treat soil and re-test.

3.03 PROTECTION

A. Do not permit soil grading over treated work.

END OF SECTION

SECTION 31 6316
AUGER CAST GROUT PILES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Machine augered shaft, placement of pressure injected grout and internal reinforcement.

1.02 RELATED REQUIREMENTS

A. Section 00 4200 - Proposal Form: Requirements for Unit Pricing

B. Section 03 2000 - Concrete Reinforcing: Requirements for concrete reinforcement.

C. Section 03 3000 - Cast-in-Place Concrete: Requirements for concrete.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 00 4200 - Proposal Form, for additional unit price requirements.

B. Designed Piles:
   1. Design Pile Quantity: Determined by the quantity of piles indicated in Contract Documents.
   2. Design Pile Length: By the linear foot measured from point to cut-off elevation as indicated.

C. Actual Piles:
   1. Actual Pile Quantity: Determined by quantity of piles identified in the Project Record Documents.
   2. Actual Pile Length: Determined by length of piles identified in Project Record Documents.

D. Adjustments in Contract Price will be made due to changes in number and length of piles, based on unit prices established in the Agreement as follows:
   1. Actual Pile Quantity, and
   2. Contract unit price per unit length multiplied by the Actual Pile Length. Base measurement on total linear measurement of piling from point to cut-off elevation.

E. Determination of Unit Measurements: Identified by site measurements and verified by the Owners Laboratory.

1.04 DEFINITIONS

A. Auger Cast Grout Piles shall also be referred to as the following:
   1. ACGP - Auger Cast Grout Piles
   2. ACIP - Auger Cast-In-Place Piles
   3. APG - Auger Pressure-Grouted Piles

1.05 REFERENCE STANDARDS

A. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2018.

B. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50 mm] Cube Specimens); 2021.

C. ASTM C150/C150M - Standard Specification for Portland Cement; 2022.

D. ASTM C618 - Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2023, with Editorial Revision.

E. ASTM C937 - Standard Specification for Grout Fluidifier for Preplaced-Aggregate Concrete; 2016.

1.06 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.07 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:
   1. Drilling rig type and torque capacity
   2. Pile Diameter
   3. Anticipated length
   4. Pile reinforcement
   5. Top of pile elevations

C. Project Record Documents: Record actual locations of piles, pile diameter, and pile length. Accurately record the following on project record documents:
   1. Sizes, lengths, and locations of piles and footing groups.
   2. Sequence of placement.
   3. Final base and top elevations.
   4. Deviation from indicated locations.
   5. Placement and configuration of reinforcement.

1.08 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years of documented experience, including a job supervisor with a minimum of three (3) years of similar experience.

B. The Piling Contractor shall submit to the Architect in writing, all applicable information as follows:
   1. Sketch and/or description of the pile drilling equipment to be utilized.
   2. Complete description of method of installation.
   3. Grout design mix per 03 3000.

C. Welders: AWS certified.

D. Prior to the start of the project, immediately after any significant maintenance or repair of the pump and any time the testing laboratory believes the pump is operating different from the last calibration, the contractor shall calibrate the pump to determined unit volume per pump stroke.
   1. The grout pump calibration shall include recording the number of full pump strokes required to fill a container of at least 55 gallons.

PART 2 PRODUCTS

2.01 MATERIALS

A. Concrete Grout Materials and Mix: Specified in Section 03 3000.

B. Hydraulic Mortars: ASTM C109/C109M

C. Aggregate for grout shall be sand meeting the requirements of ASTM C33, with a fineness modulus of 2.30 to 3.40.

D. Reinforcement: Specified in Section 03 2000; spiral wound.

E. Pier side rollers shall be placed in accordance with manufacturer's recommendations.

F. Provide 3 pile rollers around the circumference of each pile reinforcing cage, at a maximum spacing of 10 feet, with the first and last set of 3 rollers occuring within 2 feet from the top and bottom.

PART 3 EXECUTION

3.01 SUBSURFACE CONDITIONS

A. Data obtained from the subsurface investigations made at the site is included in Section 00 3132. The Architect and Owner assume no responsibility for the correctness of this information. The same type of soil strata at points other than actual test holes may be assumed, but is not guaranteed.

3.02 ACIP - PILE LOAD TESTS

A. One of each pile type (ex. Type "A", Type "B", etc.) shall be load tested on the site at separate locations, after cut and fill operations, in accordance with ASTM D1143 – "Standard Test Methods for Deep Foundation Under Static Axial Compressive Load" to a compressive load noted on the Structural Drawings. For each test, the SITA shall be paid by the Contractor as required to observe the tests and submit to the Geotechnical and Structural Engineer a load-settlement analysis.

3.03 PREPARATION

A. Use placement method that will not cause damage to nearby structures.

B. Notify adjacent and affected land owners and building occupants with 90 days notice before proceeding with the Work.

C. Protect structures near the Work from damage.

D. Prepare to place piles from excavated working elevation. Do not begin installation until ground elevation at each pile location is at least 12 inches higher than required pile cutoff elevation.

3.04 INSTALLATION

A. ACIP piles shall be installed in accordance with the ACIP pile manual (DFI 1990)1.

B. Excavation for the piles shall be drilled with a machine especially designed for that purpose. The machine shall be equipped with a power unit capable of producing up to 55,000 ft/lbs of torque. Maximum permissible variation of location shall not exceed 3 inches. Shafts shall not be out of plumb by more than 0.25 inches per foot of length or 12" total whichever is less. Shaft concrete cut-off location shall be within the range of plus 1 inch to minus 3 inches.

C. Provide a sequence of pile installation within pile groups such that the adjacent piles are not disturbed. Do not place piles within 4 pile diameters of adjacent piles or as soil conditions permit on the same day.

D. Piles shall extend to and penetrate bearing materials as shown on the Structural Drawings.

E. A continuous flight hollow shaft (minimum inside diameter of 2-1/2 inches) auger shall be rotated into the underlying soil to pre-determined tip elevation or refusal, whichever occurs first.

F. Progressively raise auger and simultaneously pressure inject concrete grout with equipment designed for such placement. Place grout in accordance with provisions of Section 03 3000.

G. Except where otherwise specifically directed by supervising engineer, drill each pile hole and fill with grout in an uninterrupted operation.

H. At the start of grout pumping, prior to raising of the augers (auger withdrawal), a minimum theoretical initial grout head of five feet shall be pumped. Minimum of five feet of grout head shall be maintained through the grouting process during auger withdrawal.

I. The volume of concrete grout placed per every 5-foot length of the pile shall not be less than 1.15 times the calculated volume for every 5-foot length of pile.

J. If the testing lab believes there was a problem during installation, the testing lab shall notify the architect and contractor within 24 hours and request recommendations from the geotechnical engineer for the pile(s) in question. Examples of evidence that there may be a problem during installation could include (but are not limited to) excessive grout in the pile in relation to the theoretical volume or not being able to install reinforcement after grout has been placed.

K. Non-augerable material shall be defined as material that the Contractor believes to be non-augerable based on an earnest attempt to penetrate the material in which the travel is less than 12 inches in two minutes. For proposal purposes, Proposers shall assume that non-augerable material will not be encountered during the project. In the event non-augerable material is encountered above the specified pile depth, the contractor shall proceed as follows:
   1. Remove the auger bit without placing any reinforcement in the hole and without installing any grout. The Contractor shall be responsible for the means and methods required to safely protect people and equipment from falling in the hole while it is open.
   2. The Testing Lab shall determine the depth of the pile shaft at refusal.
   3. Immediately Backfill the hole with the spoils from drilling the hole, adjacent holes and/or similar on-site fill.
   4. Within 24 hours of encountering non-augerable material, the Contractor shall notify the Structural Engineer and request a recommendation on how to proceed.
   5. If the Structural Engineer determines it is necessary to drill below the depth that non-augerable material was encountered, a pier drilling rig shall be mobilized and shall drill the non-augerable material to reach the depth the Structural Engineer indicates is required for the deep foundation element(s) in question.
   6. Before mobilizng a pier drilling rig, the Contractor shall estimate any additional cost required, notify the Architect that contingency funds may be required to cover the estimated additional cost, and obtain approval from the Owner for the estimated additional construction cost associated. If non-augerable material is encountered while installing multiple piles, the Contractor shall endeavor to reduce the overall additional cost associated with pier drilling equipment by minimizing the number of mobilizations and number of hours of pier drilling equipment use (active and/or standby) where possible. If multiple days of pier drilling operation are required, mobilization costs shall only apply to the first day of pier drilling unless demobilization is approved by the Owner. Once pier drilling equipment is mobilized, the Contractor shall not charge for more than 8 hours of pier drilling equipment use (active and/or standby) per day, and shall not charge for any time on weekends, unless otherwise approved by the Architect and Owner.
   7. The cost of mobilizing and operating pier equipment provided in the Proposal Form shall include all equipment, material and labor required to drill holes.
   8. When the presence of non-augerable material above the specified pile depth is sufficiently addressed (by a design change from the Structural Engineer, by pier drilling through the non-augerable material, or both), the Contractor shall then install the pile as part of the Base Proposal with adjustments to the total construction cost made by unit price if the actual pile length is different from the assumed pile length for proposal purposes.
   9. Additional costs for piles that are augered but refused without any grout or reinforcement placed and that require removal of ACIP pile drilling rig shall be determined with the unit price for ACIP pile drilling.

L. Place reinforcing steel in accordance with Section 03 2000 immediately after placement of wet grout.

M. Set tops of piles to elevations indicated.

N. Prepare pile top to receive pile cap and grade beams

O. Piles shall be poured to top of ground and the grout may be removed to the cut-off elevation prior to initial set. If hole will not stand open, the pile must be cut off after final set of mortar and the excavation for pile cap has been made. The contractor shall form the top of the hole so as to prevent a "mushroom" shape at the top, allowing expansive soil to grip the top of the pile.

P. Extend reinforcement for connection of caps and grade beams.

3.05 MIXING AND PUMPING OF GROUT

A. Only approved mixing and pumping equipment shall be used in preparing and handling the grout. All materials shall be measured by volume or weight as they are fed into the mixer. The time of mixing shall be such as to produce a homogeneous grout.

B. The cement base non-shrinkage grout shall consist of Portland cement, a grouting agent, sand and water so proportioned and mixed as to produce a mortar capable of maintaining the solids in suspension without applicable water gain; which may be pumped without difficulty and which will penetrate and fill open voids in the adjacent solids. These materials shall be proportioned to produce a hardened mortar which will achieve the design strength within 28 days, or if it contains a special pozzolan, within 90 days. The grout strength shall be specified to meet applicable codes for the specified pile size and capacity.

C. A pressure gauge in good condition shall be located on the grout pump so the grouting pressure may be checked by the operator and Construction Observer.

3.06 FABRICATION AND PLACING OF REINFORCING

A. All steel reinforcing cages shall be completely fabricated in a rigid fashion in order to permit expeditious placement into the shaft excavation by service equipment with a minimum time delay.

B. The reinforcing steel cage for the shafts, consisting of longitudinal bars and hoops or ties, shall be completely assembled and placed into the shaft as a unit. Each longitudinal bar shall be tied to each hoop or tie.

3.07 TOLERANCES

A. Maximum Variation From Vertical: 1 in 48.

B. Maximum Variation From Design Top Elevation: 4 inches.

C. Maximum Out-of-Position: 2 inches.

3.08 FIELD QUALITY CONTROL

A. An Special Inspection ans Testing Agency (SITA) will perform field quality control tests and inspections, as specified in Sections 01 4516 and 01 4533.

3.09 UNACCEPTABLE PILES

A. Unacceptable Piles: Piles that are placed out of position, are below elevations, or are damaged.

B. Provide additional piles or replace footings failing to conform to specified requirements.

3.10 CLEANING

A. Contractor shall remove and dispose off-site all spoils including grout, reinforcing and other related materials.

END OF SECTION

SECTION 32 3113
CHAIN LINK FENCES AND GATES

PART 1 – GENERAL

1.01 DESCRIPTION

A. Work included: Provide chain link fence system where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 01 of these Specifications.

1.02 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.03 SUBMITTALS

A. Comply with pertinent provisions of Section 01 3000 – Administrative Requirements.

B. Product data: Within 15 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
   1. Materials list of items proposed to be provided under this Section;
   2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
   3. Shop Drawings in sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with the work of adjacent trades;
   4. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.
   5. Samples: Accompanying the submittal described above, submit Samples of each sealant, each backing material, each primer, and each bond breaker proposed to be used.

1.04 PRODUCT HANDLING

A. Comply with pertinent provisions of Section 01 6000 – Product Requirements.

PART 2 – PRODUCTS

2.01 DIMENSIONAL DATA

A. General:
   1. Pipe sizes indicated are commercial pipe sizes.
   2. Tube sizes indicated are nominal outside dimensions.
   3. H-section sizes indicated are normal flange dimensions.
   4. Roll-formed section sizes indicated are the nominal outside dimensions.

2.02 GALVANIZING

A. On steel framework and appurtenances, provide galvanized finish with not less than the following weight of zinc per sq. ft.
   1. Pipe: 1.8 oz, complying with ASTM A120.
   2. H-sections and square tubing: 2.0 oz, complying with ASTM A123.
   3. Hardware and accessories: Comply with Table 1 of ASTM A153.
   4. Fabric: 2.0 oz, complying with class II of ASTM A121.

2.03 FABRIC - VINYL-COATED

A. Nine-gauge (9 Ga. Core wire) black resin clad fabric shall have a polyvinyl chloride coating, minimum wall thickness of .015 inches over a galvanized substrate. The base metal shall have a minimum breaking strength of five hundred fifty pounds (550 lbs.) and a zinc coat weight of .1503 pounds per square foot of uncoated wire surface. Top and bottom selvage of the fabric shall be knuckled with one and three-quarters inch (1-3/4") mesh.

2.04 POSTS, RAILS, AND ASSOCIATED ITEMS

A. Where vinyl coated fabric is specified, all post, rails and associated items shall be vinyl coated to match.

B. End, corner, slope, and pull posts: Provide at least the following minimum sizes and weights:
   1. Material and dimensions:
      a. Pipe, 2.875" outside dimension, Lbs. per lin ft: 5.79
      b. Tubing, 2-1/2" square, Lbs per lin ft: 5.70
      c. Roll-formed section, 3-1/2" x 3-1/2", Lbs per lin ft: 5.14

C. Line posts: Provide minimum sizes and weights as follows:
   1. Material and dimensions:
      a. Pipe, 2.375" outside dimension, Lbs. per lin ft: 3.65
      b. H-section, 2.25" x 1.95" x 0.143", Lbs per lin ft: 10.10

D. Gate posts: Provide gate posts for supporting single gate leaf, or one leaf of a double gate installation, for nominal gate widths as follows:
   1. Material and dimension:
      a. Pipe, 4" outside dimension: Lbs. per lin ft: 9.10
      b. Tubing, 3" square:, Lbs. per lin ft: 9.10
      c. H-section, 4", Lbs. per lin ft: 14.00
         1) Over 13 feet wide, and up to 18 feet wide: Use 6.625" outside diameter pipe weighing 14.0 lbs. per lin ft.
         2) Over 18 feet wide: Use 8.625" outside diameter pipe weighing 24.70 lbs. per lin ft.

E. Top rails:
   1. Use 1.660" outside diameter pipe weighing 1.80 lbs. per lin ft; or
   2. Use 1.625" x 1.25" roll-formed sections weighing 1.35 lbs. per lin ft.
   3. Provide in manufacturer's longest lengths, with expansion type couplings approximately 6" long for each joint.
   4. Provide means for attaching top rail securely to each gate, corner, pull, slope, and end post.

F. Mid-Rails:
   1. Provide mid-rail for fences 8'-0" tall and higher, same as top rail.

G. Post brace assemblies:
   1. Provide at end and gate posts, and at both sides of corner, slope, and pull posts, with the horizontal brace located at mid-height of the fabric.
   2. Use 1.660" outside diameter pipe weighing 1.80 lbs. per lin ft for horizontal brace.
   3. Use 3/8" diameter rod with turnbuckle for diagonal truss.

H. Tension wire: Provide number 7 gage galvanized coiled spring wire at bottom of fabric.

I. Post tops:
   1. Provide steel, wrought iron, or malleable iron, designed as weathertight closure cap.
   2. Provide one cap for each post.
   3. Provide caps with openings to permit through passage of top rail.

J. Stretcher bars:

1. Provide one-piece lengths equal to full height of fabric, with a minimum cross-section of 3/16"x 3/4".
2. Provide one stretcher bar for each gate and end post, and two for each corner, slope, and pull post, except where fabric is woven integrally into the post.

K. Stretcher bar bands:
1. Provide steel, wrought iron, or malleable iron, spaced not over 15" on centers, to secure stretcher bars to end, corner, pull, slope, and gate posts.
2. Bands may be used also with special fittings for securing rails to end, corner, pull, slope, and gate posts.

2.05 GATES

A. General:
1. Fabricate gate perimeter frames of tubular members.
2. Provide additional horizontal and vertical members to assure proper operation of the gate, and for attachment of fabric, hardware, and accessories.
3. Space so frame members are not more than 8 feet apart.
4. Fabricate gate frames from:
a. Materials and dimension:
1) Pipe 1.90" outside diameter, Lbs. per lin ft: 2.72
2) Tubing, 2" square, Lbs. per lin ft: 2.60

B. Fabrication:
1. Assemble gate frames by welding with special malleable or pressed steel fittings and rivets for rigid connections.
2. Use same fabric as used in the fence.
3. Install fabric with stretcher bars at vertical edges as a minimum.
4. Attach stretchers to gate frame at not more than 15" on centers.
5. Attach hardware with rivets or by other means which will provide security against removal and breakage.
6. Provide diagonal cross-bracing consisting of 3/8" diameter adjustable length truss rods on gates where required to provide frame rigidity without sag or twist.

C. Gate hardware: Provide following for each gate:
1. Hinges:
a. Pressed or forged steel, or malleable iron, to suit the gate size; non-lift-off type, offset to permit 180 degree opening.
b. Provide 1-1/2 pr of hinges for each leaf over 6 feet in nominal height.
2. Latches:
a. Provide forked type or plunger-bar type to permit operation from either side of the gate.
b. Provide padlock eye as integral part of latch.
3. Keeper: Provide keeper for vehicle gates, which automatically engages the gate leaf and holds it in the open position until manually released.
4. Double gates:
a. Provide gate stops for double gates consisting of mushroom or flush plate, with anchors.
b. Set in concrete to engage the center drop rod or plunger bar.
c. Provide locking device and padlock eyes as an integral part of the latch, requiring one padlock for locking both gate leaves.

D. Chain link cantilever slide gate system: Manual or Motorized as indicated on the drawings

1. Gate to be made of Aluminum Alloy 6005-T61. All square members are 2” sq. weighing 0.94 lb. /ft. Complete frame welded to one piece track and 4” x 2” bottom rail weighing 1.71 lbs. /ft.. Supply 2 truck assemblies that are swivel type having lubricated and sealed ball bearing wheels.
2. Gateposts, 4” O.D. schedule 40 weighing 9.11 lb. /ft.
3. Fabric shall be 9 gauge G.A.W.
4. Electrically operated horizontal slide gates must be manufactured and installed to comply with the safety requirements of ASTM F2200 and UL 325.
5. See Section 32 3132-Vehicular Gate Operators for motorized gates.
6. Basis of Design: Secure-Track Chain Link Cantilever Slide Gates manufactured by Merchants Metals.

2.06 MISCELLANEOUS MATERIALS AND ACCESSORIES

A. Wire ties:
   1. For tying fabric to line posts, use number 9 gage wire ties spaced 12" on centers.
   2. For tying fabric to rails and braces, use number 9 gage wire ties spaced 24" on centers.
   3. For tying fabric to tension wire, use number ll gage hog rings spaced 24" on centers.
   4. Manufacturer's standard wire ties will be acceptable if of equal strength and durability.

B. Concrete: Comply with provisions of Section 03 3000 – Cast-in-Place Concrete for 2500 psi concrete.

PART 3 – EXECUTION

3.01 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 GUARANTEE

A. The contractor shall furnish a written guarantee warranting all materials, devices, and workmanship to be free of defects for a period of one year from the date of completion and acceptance. Any defects in materials, devices, and workmanship which become apparent within the guarantee period shall be repaired or replaced by the contractor at his own expense, and at no additional cost to the Owner.

3.03 INSTALLATION

A. General:
   1. Install posts at a maximum spacing of 10 feet on centers.
   2. Install corner or slope posts where changes in line or grade exceed a 30 degree deflection.

B. Excavating:
   1. Drill holes for post footings in firm, undisturbed or compacted soil, strictly adhering to the dimensions and spacing shown.
   2. Post hole dimensions:
      a. Provide 30" deep by 8" diameter foundations for line posts for 5 foot fabric height and less.
      b. Provide 36" deep by 8" diameter foundations for line posts for fabric heights exceeding 5 feet.
      c. Provide 36" deep by 12" diameter foundations for all other posts.
   3. Spread soil from excavations uniformly adjacent to the fence line, or on adjacent areas of the site if so directed.
   4. When solid rock is encountered near the surface, drill into rock at least 12" for line posts and at least 18" for end, pull, gate, and corner posts. Drill hole at least 1" greater diameter than the largest dimension of the post to be placed.

5. If solid rock is below soil overburden, drill to full depth required, except penetration into rock need not exceed minimum depths specified above.

C. Setting posts:
1. Remove loose and foreign materials from sides and bottoms of holes, and moisten soil prior to placing concrete.
2. Center and align posts in holes.
3. Place concrete around posts in a continuous pour, and vibrate or tamp for consolidation.
4. Check each post for vertical and top alignment, and hold in position during placement and finishing operations.
5. Trowel tops of footings, and slope or dome to direct water away from posts.
6. Extend footings for gate posts to the underside of bottom hinge.
7. Set keeps, stops, sleeves, and other accessories into concrete as required.
8. Keep exposed concrete surfaces moist for at least seven days after placement, or cure with membrane curing material or other curing method approved by the Architect.
9. Grout-in those posts which are set into sleeved holes, concrete constructions, or rock excavations, using non-shrink Portland cement grout or other grouting material approved by the Architect.

D. Concrete strength:
1. Allow concrete to attain at least 75% of its minimum 28-day strength before rails, tension wires, and/or fabric is installed.
2. Do not, in any case, install such items in less than seven days after placement of concrete.
3. Do not stretch and tension fabric and wire, and do not hang gates, until concrete has attained its full design strength.

E. Rails and bracing:
1. Install fence with a top rail and bottom tension wire.
2. Install top rails continuously through post caps or extension arms, bending to radius for curved runs.
3. Provide expansion couplings as recommended by the fencing manufacturer.
4. Provide bracing to the midpoint of the nearest line post or posts at all end, corner, slope, pull, and gate posts.
5. Install tension wires parallel to the line of fabric by weaving through the fabric, and tying to each post with not less than number 6 gage galvanized wire, or by securing the wire to the fabric.

F. Installing fabric:
1. Leave approximately 2" between finish grade and bottom selvage.
2. Excavate high points in the ground to clear the bottom of the fence.
3. Place and compact fill to within 1" of the bottom of the fabric in depressions.
4. Pull fabric taut and tie to posts, rails, and tension wires.
5. Install fabric on outward side facing side of fence, and anchor to framework so that the fabric remains in tension after pulling force is removed.
6. Install stretcher bars by threading through or clamping to fabric on 4" centers, and secure to posts with metal bands spaced 15" on centers.

G. Installing gates:
1. Install gates plumb, level, and secure for full opening without interference.
2. Install ground-set items in concrete for anchorage in accordance with the fence manufacturer's recommendations as approved by the Architect.
3. Lubricate and adjust the hardware for smooth operation.

H. Miscellaneous:

1. Use U-shaped tie wires, conforming to diameter of pipe to which attached, clasping pipe and fabric firmly with ends twisted at least two full turns.
2. Bend ends of wire to minimize hazards to persons and clothing.
3. Fasteners:
   a. Install nuts for tension band and hardware bolts on side of fence opposite fabric side.
   b. Peen the ends of bolts to prevent removal of nuts.
4. Repair coatings damaged in the shop or field erection, using a hot-applied repair compound applied in accordance with its manufacturer's recommendations as approved by the Architect.

END OF SECTION

SECTION 32 3119
DECORATIVE METAL FENCES AND GATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Decorative steel fences.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

B. ASTM F2408 - Standard Specification for Ornamental Fences Employing Galvanized Steel Tubular Pickets; 2016.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to start of work of this section; require attendance by affected installers.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Shop Drawings:
   1. Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, gates, and schedule of components.

D. Manufacturer's Warranty.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum five years experience.

B. Installer Qualifications: Experienced with type of construction involved and materials and techniques specified and approved by fence manufacturer.

1.07 DELIVERY, STORAGE AND HANDLING

A. Store materials in a manner to ensure proper ventilation and drainage. Protect against damage, weather, vandalism and theft.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Provide twenty year manufacturer warranty for defects in material finish, including cracking, peeling, chipping, blistering or corroding.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Decorative Metal Fences and Gates:
   1. Ameristar Perimeter Security, USA: www.ameristarfence.com.
   2. Superior Aluminum Products, Inc: www.superioraluminum.com/#sle.

3. Fortress Fence Products: www.FortressFence.com
4. Master-Halco, Inc.: www.fenceonline.com
5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FENCES

A. Fences: Complete factory-fabricated system of posts and panels, accessories, fittings, and fasteners; finished with electrodeposition coating, and having the following performance characteristics:

B. Steel: ASTM A653/A653M; tensile strength 45,000 psi, minimum.
1. Hot-dip galvanized; ASTM A653/A653M, G60.
2. 62 percent recycled steel, minimum.

2.03 WELDED STEEL FENCE

A. Basis of Design: Montage Plus, Genesis, Fence System as manufactured by Ameristar Perimeter Security, USA.

B. Material sizes given are minimum sizes and shall be designed by the fence manufacturer.

C. Provide fence meeting requirements for Industrial class as defined by ASTM F2408.

D. Fence Panels: Fusion welded; 6 feet high by 8 feet long.
1. Panel Style: Three rail.
2. Attach panels to posts with manufacturer's standard panel brackets.

E. Posts: Steel tube.
1. Size: square by 16 gage, 0.0598 inch, with manufacturer's standard cap.

F. Rails: Manufacturer's standard, steel channel, nominal 1-1/2 inch square by 14 gage, 0.0747 inch with pre-punched picket holes.

G. Pickets: Steel tube.
1. Spacing: 3-3/4 inch clear, nominal.
2. Size: 3/4 inch square by 18 gage, 0.0478 inch.
3. Style: Pickets with finial extend above top rail.
4. Finial: Square Top.

H. Flexibility: Capable of following variable slope of up to 1:2.

I. Color: Black.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Set fence posts in accordance with the manufacturer recommended spacing.

C. When cutting rails immediately seal the exposed surfaces by:
1. Removing metal shavings from cut area.
2. Apply zinc-rich primer to thoroughly cover cut edge and drilled hole; allow to dry.
3. Apply two coats of custom finish spray paint matching fence color.
4. Failure to seal exposed surfaces in accordance with manufacturer's instructions will negate manufacturer's warranty.

D. Space gate posts according to the manufacturers' drawings, dependent on standard out-to-out gate leaf dimensions and gate hardware selected.
   1. Identify the necessary hardware required for the application on the manufacturer's gate drawings.
   2. Provide gate hardware by the manufacturer of the gate and install in compliance with manufacturer's recommendations.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch.

B. Maximum Offset From Indicated Position: 1 inch.

C. Minimum Distance from Property Line: 6 inches.

3.05 CLEANING

A. Leave immediate work area neat at end of each work day.

B. Clean jobsite of excess materials; scatter excess material from post hole excavations uniformly away from posts. Remove excess material if required.

C. Clean fence with mild household detergent and clean water rinse well.

D. Remove mortar from exposed posts and other fencing material using a 10 percent solution of muriatic acid followed immediately by several rinses with clean water.

E. Touch up scratched surfaces using materials recommended by manufacturer. Match touched-up paint color to factory-applied finish.

3.06 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair, or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 32 3132
VEHICULAR GATE OPERATORS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Electric slide gate operators

B. Sensors and controls.

1.02 RELATED SECTIONS

A. 32 3113 - Chainlink Fences and Gates

B. Division 26 – Requirements for electrical connections.

1.03 RELATED WORK

A. Parking control / gate operator systems contractor shall coordinate all work with other contractors and trades where necessary.

B. All necessary conduit, raceways and pull boxes shall be installed by the electrical contractor.

C. Installation of the vehicular swing gate operator system shall be coordinated with the installation of other parking control related systems.

1.04 REFERENCE STANDARDS

A. Underwriters Laboratories (UL): UL 325 - Standard for Safety for Door, Drapery, Gate, Louver, and Window Operators and Systems.

B. Underwriters Laboratories (UL): UL 991 - Standard for Tests for Safety Related Controls Employing Solid-State Devices.

C. American Society Testing Materials (ASTM): ASTM F2200 - Standard Specification for Automated Vehicular Gate Construction.

D. National Electrical Manufacturers Association (NEMA): NEMA ICS 6 - Industrial Control Systems: Enclosures.

1.05 SUBMITTALS

A. Submit under provisions of Section 01 3000 - Administrative Requirements.

B. Product Data: Manufacturers data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements.
   3. Installation methods.

C. Shop Drawings: Submit shop drawings showing layout, profiles, and product components, including anchorage, edge connections, and accessories.
   1. Operation, installation, and maintenance manuals including wire diagrams.
   2. Risers, layouts, and special wiring diagrams showing any changes to standard drawings.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle materials and products in strict compliance with manufacturer’s instructions and industry standards.

B. Store products indoors in manufacturer’s original containers and packaging with labels clearly identifying product name and manufacturer. Protect from damage.

1.07 QUALITY ASSURANCE

A. Installation shall comply with all applicable codes.

B. All equipment shall be new, in current production, and the standard products of a manufacturer of vehicular gate operator equipment.

C. Manufacturer shall guarantee availability of parts, for a minimum of seven (7) years from date of shipment.

D. If required, manufacturer shall be able to demonstrate features, functions and operating characteristics to the Owner.

E. System shall be installed by a factory authorized contractor, with technicians specifically trained in this system.

F. On-site maintenance and repair service shall be available locally and within four (4) hours of notification for emergency condition.

1.08 WARRANTY

A. Products shall include a factory warranty that equipment is free from defects in design, material, manufacturing and operation. Factory warranty period shall be for five (5) years parts and workmanship; 60-months from date of shipment.

B. Manufacturer shall not be responsible for improper use, handling, or installation of the product.

C. Installing contractor shall guarantee the equipment, wire and installation for 12-months from date of acceptance.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. LiftMaster: www.LiftMaster.com.

B. DoorKing, Inc.: www.doorking.com

C. Substitutions: See Section 01 6000 - Product Requirements.

2.02 SYSTEM DESCRIPTION

A. Furnish and install a complete microprocessor based vehicular gate operator system, with a solid-state board to control all functions of the swing gate operator, as described herein and shown on the plans. Include all necessary control boards, power supplies, loop detectors, connectors, and accessories for a complete operational system.

B. Slide Gate Operator:
   1. The slide gate operator shall use a microprocessor based solid-state control board that controls all functions of the slide gate operator. Operator shall be rated for continuous duty for use in residential, commercial and industrial applications.
   2. Primary reduction system shall employ an adjustable clutch and power transfer shall be provided by single cog belt drive train.
   3. Operator shall employ magnetic sensing to set open and close limit adjustment. Mechanical type limit switches shall not be allowed.
   4. Operator shall automatically set both open and close limit adjustments upon power-up and activation in the open direction. Operator shall automatically sense for any gate coasting to insure true limit settings.
   5. Pulling medium shall provide a positive mechanical connection to the gate system. Friction driven rail type pulling mediums shall not be allowed. Roller chain pulling medium shall be minimum size #40.
   6. A positive dead bolt shall activate only when the gate is forced open, to reduce solenoid lock wear and failure.
   7. Operator shall be capable of being mounted at the front, center or rear of the gate system, shall be designed for either left or right hand mount and shall be designed for pad or post mounting.
   8. Operator frame shall use 12-gauge G90 galvanized steel to avoid rusting and shall be painted charcoal gray.
   9. Operator shall have two 115 VAC convenience outlets available for accessory transformer power and shall have a built-in lockable power disconnect and reset switch.

C. Fail-Safe Operation
   1. To prioritize safety over security, operator shall assume a fail-safe mode in the event of a power loss or if an entrapment is sensed (entrapment alarm activated).
      a. Operator shall revert to a fail-safe mode allowing the gate to be pushed open without any special knowledge or use of any special cranks, keys or other devices.

D. Primary Electronic Reverse
   1. The vehicular gate operator shall be equipped with an inherent electronic obstruction sensing system. The electronic sensing system shall automatically cause the gate operator to stop and reverse if an obstruction is sensed during the open or close cycle.
   2. For enhanced safety, the control circuit shall check the obstruction sensing system circuit prior to the start of each cycle of operation. Should the control circuit detect a fault in the obstruction sensing system, the motor shall not be allowed to start.

E. Secondary Entrapment Prevention
   1. Non-contact sensors, or contact sensors, or combination thereof, shall be utilized to prevent persons from becoming entrapped in the gate system.
   2. Warning signs shall be installed in accordance with manufacturer's installation instructions and UL 325 guidelines.

F. A complete operational system shall be provided.

2.03 EQUIPMENT

A. Model 9150 Vehicular Slide Gate Operator
   1. Single cog belt drive train with adjustable clutch.
   2. Automatic limit / coast magnetic adjustment system.
   3. Solid-state control circuit and motor control.
   4. Partial open limit feature.
   5. Anti-Tailgate feature.
   6. UL Class of Operation: I, II, III and IV.
   7. #40 roller chain.
   8. Dimensions: 24 inches high, 15 inches wide, 16.5 inches deep.
   9. Horsepower
      a. 1/2 HP: 1000 Lb maximum gate weight, 800 Lb if convenience open option is installed. 30-ft maximum gate length, approximately 1-ft/sec gate speed.
   10. Power
      a. 115 VAC

B. Entrapment Prevention : The type of device(s) and placement are dependant on the application and construction of the vehicular swing gate and shall be determined on-site by the vehicular gate operator system installer.
   1. Non-contact sensors (photo-cells).
   2. Contact sensors

C. Accessories
   1. Plug-in loop detectors.
   2. Thermostatically controlled heater kit.
   3. Red/Green traffic signal.
   4. Gate Tracker: provides time and date stamped electronic record of cycles, input errors, loop detector input errors, obstruction hits and power cycles.
   5. Backup power inverter – allows system to remain operation upon loss of primary (AC) power.

D. A complete operational system shall be provided.

PART 3 - EXECUTION

3.01 EXAMINATION AND PREPARATION

A. Inspect and prepare substrates using the methods recommended by the manufacturer for achieving the best results for the substrates under project conditions.

B. Do not begin installation until substrates have been properly cleaned and prepared. Commencement of installation constitutes acceptance of conditions.

C. If preparation is the responsibility of another installer, notify Architect in writing of unsatisfactory preparation before proceeding.

3.02 INSTALLATION

A. Install in accordance with manufacturer’s installation instructions. Test for proper operation and adjust until satisfactory results are obtained.

3.03 SYSTEM INITIALIZING AND PROGRAMMING

A. System shall be turned on and adjustment made to meet requirements of specifications and on-site conditions.

B. System shall function as specified.

3.04 SYSTEM TEST PROCEDURES

A. System shall be completely tested to assure that all components and accessories are hooked-up and in working order.

B. System shall be pre-tested by contractor and certified to function in accordance with plans and specifications.

C. System shall be tested in presence of owner's representative.

3.05 OWNER INSTRUCTIONS

A. Installation contractor shall conduct up to (1) hour of instruction in use and operation of the system to designated owner representatives, within (30) days of acceptance.

B. Installation contractor shall conduct up to (1) hour of technical training, in troubleshooting and service of the system, to designated owner representatives within (90) days of system acceptance.

3.06 MANUALS AND DRAWINGS

A. Contractor shall provide owner with (2) copies of standard factory prepared operation, installation and maintenance manuals. Manuals shall include typical wiring diagrams.

B. Contractor shall provide owner with (2) copies of any risers, layouts, and special wiring diagrams showing any changes to standard drawings, if required on project.

3.07 MAINTENANCE

A. The manufacturer recommends periodic maintenance at three month intervals as described in the installation and maintenance manual.

B. External reversing devices should be checked at least once a month.

END OF SECTION

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